

OFFICE MACHINES,  
APPLIANCES AND METHODS

# OFFICE MACHINES, APPLIANCES AND METHODS

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## PREFACE

THE growth of offices makes organization imperative, since the success of a large business is now more dependent upon the smooth running and efficiency of the office staff than formerly. The attitude of British business men has practically become enthusiastic in favour of labour-saving machinery in the factory, but in the office little or no attempt is made to introduce machinery. It is undoubtedly true to say that while modern methods are being applied to factories the office staff is frequently not considered, and if business men gave the minute attention to the working of the office which is generally given to the factory, a very large field for cutting down expenses would be discovered.

I have investigated the work of a very large number of offices, and my inspections almost invariably disclose that an inordinate amount of time is wasted by the employment of old-fashioned and laborious methods. Modern business organization requires that all records and correspondence should be in perfect order, that statistical and accounting data should be available as soon as possible, and that the general routine work of the office should be carried out efficiently and accurately. Now, of course, this can be accomplished in the old-fashioned office, providing sufficient staff is put on the work, but an inspection of a well-organized office will demonstrate that efficiency is obtained at a minimum cost by the employment of labour-saving office machinery and appliances.

The increase of " Office Costs " in the computation of prices has, in many cases, risen unnecessarily, with the result that firms find that a disproportionately large percentage has to be added to the manufacturing costs for office expenses. These costs can be considerably reduced by the introduction of machinery which will enable the work to be done in a far more reliable manner, often with cheaper labour and always

with less staff. In the case of a growing concern, or where it is proposed to call for more data concerning the working of the business, it will often be possible to meet the increase of work with the existing staff, by the use of machines.

The change from manual and mental to machine methods is bound to come in the office as it has in the industrial world. When the business man recognizes that much of the routine work now being performed in the office, consisting of the mental drudgery of adding long columns of figures, of making monotonous calculations, of writing or typing the same matter over and over again, and, indeed, of the handling of any bulk of work in any form, can be done more efficiently, more quickly, and at a considerably lower cost by machines, he will not hesitate to change his methods.

displacement of labour, the lowering of wages, or a monotony of work, but increases trade to a greater degree than the machines save labour. When the supersession of the stage-coach was threatened by the steam-engine many people said they would never travel by train. In like manner antipathy towards office machines which may exist at first is soon overcome, and it is remarkable that in many offices where the prejudice against mechanical methods was very great the clerks now object to performing the operations by mental processes, and the machines are in great demand.

There is also an impression that the use of machines in the office entails the employment of skilled mechanics since some office machines appear to be very complicated and to need the attention that is given to factory machinery. I have used practically all the machines mentioned in this book—some over a period of years—and though the mechanism of many of the machines is admittedly complicated I feel confident that the inventors of office machines have so constructed them as to make them perform their functions without skilled attention or adjustments. The hobby horse was a very simple appliance, and though it became more complicated when a driving gear and pedals were added, and has become far more so now that a motor has been fitted, still it has also become so much more speedy and efficient that no one would think of reverting to the hobby horse. It is equally noteworthy that when modern labour-saving machines and appliances are once adopted in the office, there is very rarely a reversion to the older method.

Modern methods must necessarily be introduced into the office or the tide of progress will be arrested. In the course of a few years machines will do practically the whole of the routine work of an office in the same way as they do at present in the factory, and clerks will be employed on better work. The facilities afforded for bringing to the knowledge of business men the various kinds of machines and appliances available are far from satisfactory, the various Business Exhibitions being at present probably the only means. It

is, therefore, very difficult for the ordinary business man to ascertain particulars of the existing machines, and it is not altogether surprising that I have found many of them totally ignorant of even the existence of most of the machines mentioned in this book. It has been my aim in the compilation of this book to bring together under separate chapters the various classes of office machines and appliances which are available for different classes of office work. While every effort has been expended to make the book as complete as possible and to offer unbiased views on the classes of work for which the machines are suitable, no attempt has been made to compare the merits or demerits of the various machines but rather to describe them sufficiently to stimulate the enterprising business man into making further enquiries into the subject of finding the machines best adapted to his special needs. Furthermore, it does not follow that because a machine has not been included or described in detail it is not recommended. When there are several machines of the same type on the market, or when there are several of slightly different construction that possess identical capabilities, it is generally not possible to postulate that one is better on all points than another since the precise nature of the work required to be done is generally the governing factor.

The object of the book, therefore, is to urge the importance of considering the introduction of labour-saving machines and appliances into offices, to show some of the uses to which they can be applied, to enable a business man to gauge of the possibility of their introduction into his office, and generally to provide interest in the modernization of the office. It is not intended to "pull" any machine or appliance, and while the various firms mentioned have kindly loaned many of the blocks and suggested for my consideration certain amendments in the text, nothing of the nature of advertising has been allowed to vitiate the objects of the author and publishers.

W. D.

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# OFFICE MACHINES, APPLIANCES AND METHODS

## CHAPTER I

### ADDING MACHINES

General Remarks--Non-listing & Listing Machines--The Comptometer--The Burroughs The Dalton.

MODERN business organization necessitates the computation of a large amount of statistical data, and, generally speaking, the more highly organized the business the greater the amount of information required. Many successful firms undoubtedly owe much of their success to the production of such statistical reports, for it is only by perusing figures that the managers can see exactly where the profits or losses are occurring and so adjust the organization and transactions accordingly. In several large business firms the manager has a report every morning showing the amount of material manufactured, the amount despatched, the amount of the orders received for each class of goods, together with detailed particulars as to the work of each department and each traveller on the previous day. Now this information is obtained only by carefully considered statistical records and generally by the employment of machinery. If such data is to be of any value at all it must be reliable.

The adding machine is rapidly finding its way into offices, and next to the typewriter is undoubtedly the machine most widely used. Enterprising business men have not been slow to realize the possibilities of an adding machine, and the BURROUGHS and COMPTOMETER have achieved a sound popularity. It is, however, a common impression that adding machines can only be used with advantage for the totting of long columns of figures, and many firms who do not have



a great amount of this class of work consider that the capital outlay would not be justified. But even a cursory examination of the capabilities of the adding machine will show how great are the uses to which the machines can be put, since in addition to adding they can be used for a great variety of purposes in which figures are required to be tabulated or calculated.

Adding machines can be divided into two types: (a) a machine which adds on the depression of the keys and shows the total on the "register" in front (usually termed a "Non-listing machine"), and (b) a Listing machine which prints each item and the totals.

### NON-LISTING v. LISTING MACHINES.

A machine that gives a printed record is much slower in operation than one that does not print. But in many instances a printed record of the details is required, and if original invoices or returns are tabulated direct into the summary sheets or schedules by the machine, the copying is saved and the risk of error in that copying is eliminated if the originals are called over with the tabulation sheet. For checking work and for casting columns of figures a printed record is not necessary, and the superior speed of the non-lister (two-and-a-half to three times faster) is a great advantage. In other cases where a printed record is desired only for calling over or as evidence that the work has actually been checked, it is usually expedient to dispense with the printed record, though many people imagine that it is impossible to check without a printed record. As a means of checking this method is vastly inferior to the simple process of doing the work again, on a non-listing machine if possible, by another operator or in the reverse order. This re-cast method is not only more sound, since it is generally acknowledged that proof reading of figures is difficult and subject to errors, but is also much faster. For audit purposes there is no reason whatever for the use and retention of printed records of the casts, and the whole of the calculating work of

a firm can be carried out on non-listing machines provided effective checks are introduced. Before installing either type of machine, careful consideration should be given to the capacities of each to do the work. Both have their advantages in their respective fields, which are set out below, but the non-listing type has the additional advantage of being capable of use for calculating work as described on page 15.

### NON-LISTING MACHINES.

The most popular non-listing machine is undoubtedly the **COMPTOMETER**. It is a very light portable machine, which can be manipulated on the desk at the side of the work to be cast. It is made in a number of models—the decimal, the pounds, shillings and pence, the fractions, the rupees, annas and pies, and special models for weights, measures or time.

It consists of a keyboard of nine figures in each column marked 1 to 9. A number of columns (according to the model) form a bank of keys and these, when depressed, actuate a series of segment levers, which in turn actuate the numeral wheels of the register. The operation of the machine is completed simply by depressing the keys—no auxiliary movements of any kind are necessary. The results of each calculation are shown on the register in front of the machine, and the totals are cancelled by pushing back the handle on the right. With a little practice it is possible to cast long columns at a very fast rate, and without the fatigue that usually follows this class of work when done mentally for long periods. The enormous amount of time that can be saved is difficult to appreciate without actual demonstration.

The Comptometer, as practically all machines, is infallible in its results, but no safeguards can be expected on any machine which would wholly eliminate the possibility of human error in its operation. It is obviously impossible to entirely guard against the depression of the wrong key, or the repetition, omission, or misteading of any item: but the fact that the calculation can very quickly be done twice—in other words proved—together with certain mechanical

safeguards, guarantees accuracy to a degree unknown in mental calculation. In the older models there was the risk of insufficient depression of the keys, but in all the present models this risk has been overcome by a device, special in

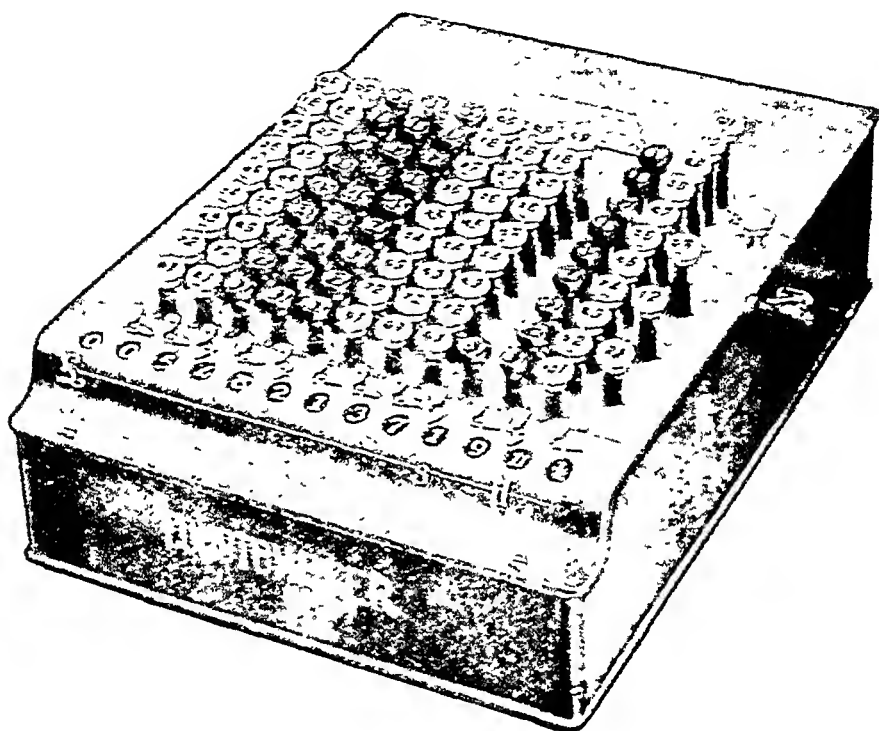


FIG 1  
COMPTOMETER

shortly another safeguard will be added. It will be a "clear signal," which causes a bell to ring on the depression of the first key at the beginning of a new operation, thus showing that the machine stands at zero, and also gives a slight added resistance to the touch of the first key.

It is expedient to check all additions done on the Comptometer, as, indeed, it is necessary to do when they are mentally cast, but the checking on the Comptometer does not involve the labour which a mental check entails. It is, of course, often considered unnecessary to check additions when a cross-cast or other check is present, but there is always a risk of a counterbalancing error; commercially, this risk is generally taken with a skilled operator, since the percentage of error is very small and it has been found that the average number of errors made amounts to about 1 in 3,000 items set on the machine.

The Comptometer, however, is by no means simply an adding machine. It also subtracts, multiplies, and divides, and practically any arithmetical calculation (including the extraction of a cubic root) may be performed by its aid. Its uses in calculating are dealt with under Calculating Machines (page 15). The Burroughs Non-lister is similar in many respects, but it differs in a few features.

### LISTING MACHINES.

There are several listing machines available, but the BURROUGHS is the most popular machine. The listing device on all machines records every item that is set, and when the total or sub-total is struck it likewise prints it. These items are sometimes printed on a roll of paper at the back of the machine, and the strip of paper relating to any column or particular set of figures is torn off and used for record or checking purposes. But this is by no means the best use of the listing device, for it can be utilized for a large number of purposes by inserting forms, statements, loose-leaf ledgers, invoices, schedules, etc., into the machine and filling in the necessary figures. The Burroughs is essentially one of the

machines that can be adapted to business purposes, for it is made in a large number of models which are designed to suit all classes of work, and further, special types of machines can be built to meet particular requirements. It can be used for

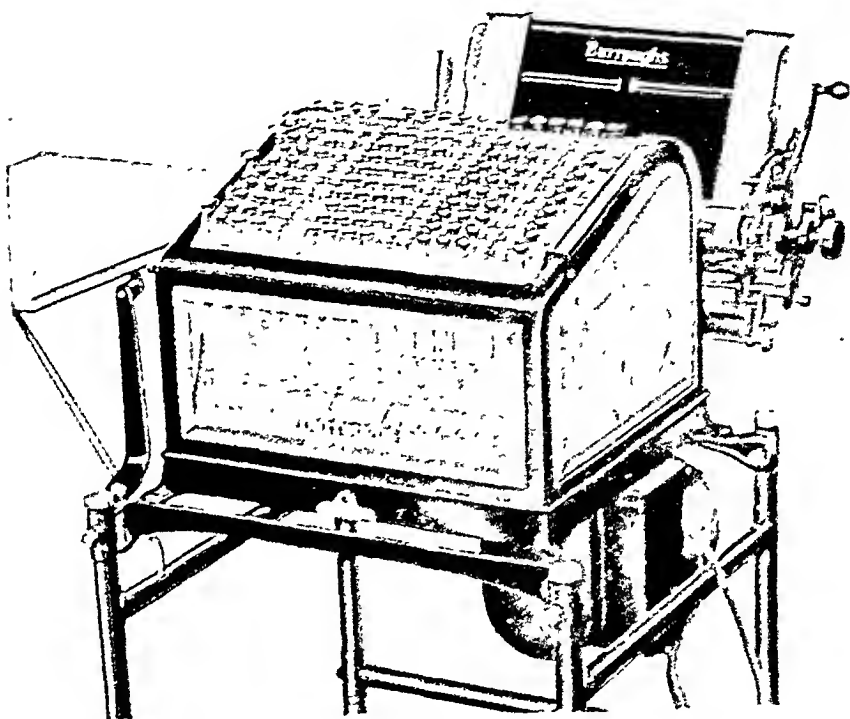


FIG. 2  
BURROUGHS

varies with the size of the machine, and if a sterling or avoirdupois model is required there would be columns for shillings, pence, and farthings, or hundredweights, quarters, and pounds. The operation of the machine consists in depressing the necessary keys in the various columns, each item being printed by the movement of the handle, or in the electrically-driven models by a touch of the space bar, and the totals are accumulated; when a total is required the total key is depressed and the machine prints the total and clears the wheels; but nothing is recorded in the machine until the handle or the bar has been operated, thus allowing a correction to be made before it is recorded in the machine. As experience proves that in typewriting or key operating of any kind, the operator is generally conscious of having struck a wrong key, this feature reduces the percentage of error very considerably.

A large number of variations are possible. In some models there is an unlimited split device which enables the keyboard to be divided into any number of adding sections, which can be arranged to print into the columns of a form or table. Another device enables the operator to print the number or date of a cheque, warrant, return, etc., by the side of the amount without including the former in the total. The "duplex" or "upper and lower case" machine enables debit and credit balances to be extracted in once going through the books, and the totals of each can be given. There is also an adding and subtracting model which is largely used by banks and commercial houses for posting current account ledgers and statements. From the previous balance the machine deducts automatically the cheques drawn, adds the deposits, if any, and gives the balance in the balance column on the right-hand side. This machine can also be used for posting stock records, an operation which always entails a considerable amount of book-keeping. (See also p. 23.)

## SPEED OF OPERATION.

The speed at which the machine can be operated varies with the type of machine and the nature of the figures that

are being handled. On an average 1,000 four figure items can be listed per hour, but over 3,000 sales tickets or cheques are frequently listed per hour. In arriving at an estimate of the time that a job will take 1,000 items per hour is a good basis on which to work.

### TOTALIZING RETURNS, INVOICES, Etc.

In large numbers of concerns it is the practice to enter up returns, invoices, etc., into books and then cast every page with carry-forward and brought-forward totals. Now this method, although very common at the present day, is archaic, and taking every considerable factor into consideration it is difficult to justify such a method. In a certain office visited recently clerks were employed in handling weekly returns of stocks held at various branches. There were eight returns received from each of 1,000 branches and each return averaged about three items. As it was necessary to consider comparative figures the returns were laboriously posted into eight books and subsequently cast mentally, the work occupying the whole of the time of sixteen male clerks. By careful consideration of this work eight sheets were drawn up for use in the Burroughs machine—each sheet carrying five weekly returns—the returns coded and entered direct on to the loose-leaf tables and added. Two girls were then able to deal with the whole of this work and the capital expenditure on the machines was covered in nine weeks, the annual saving in staff alone being £2,500. This economy was effected on one job in one small section of an office, and it is asserted that proportionate economies could be effected in hundreds of offices. A very great economy can generally be effected by listing returns, invoices, bills, slips, wage cards, etc., direct on to the Burroughs machine, especially when printed records are required for auditing, comparative purposes, etc., The machine will probably perform this class of work in a mere fraction of the time required for the old-fashioned method of entering into cumbersome books.

THE FEDERAL ADDING MACHINE, which has been thoroughly tested and used in America, is now to be manufactured in this country. It is very similar in many respects to the BURROUGHS or the WALES, and its special features are that the motor is built inside the machine, it is fitted with a flexible multiple keyboard, and all the totals are automatically printed in red.

THE DALTON is quite different in principle from other adding machines in that it is operated by ten keys only. It is claimed that this machine is very fast on account of the fact that the keys are arranged for "touch" operation, and one hand can cover the whole keyboard. The Dalton is an adding listing machine, but by the use of the repeat key in connection with the cipher key multiplication can be accomplished, and with the repeat key and a table of reciprocals division is simple and practical. This machine has not yet become very popular in this country as no sterling model is available, but it is now proposed to construct a model for British currency.

## ADDING MACHINES

### *Non-listing Type*

- BARRETT. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria Street, London, E.C.4.  
 BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
 COMPTONER. Herbert E. Robbins, Ltd., Imperial House, Kingsway, London, W.C.2.  
 VICTOR. Victor Adding Machine Co., 817-25 West Washington Blvd., Chicago.

### *Listing Type*

- BARRETT. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria Street, London, E.C.4.  
 BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
 DALTON. Merham Trading Co., Ltd., 101-1 Bank Chambers, 329 High Holborn, London, W.C.1.  
 FEDERAL. British Federal Office Machines, 19 Regent Street, London, S.W.1.  
 VICTOR. Victor Adding Machine Co., 817-25 West Washington Blvd., Chicago.  
 WALES. Metro Bureau Equipment, Ltd., Queen's House, 8 Queen Street, London, E.C.4.



justify itself it should be installed. Moreover, it should be remembered that the mental work of calculating is undoubtedly fatiguing, and if this mental strain upon the staff can be reduced to a simple mechanical process and the working capacity of the clerks increased for other classes of work, it should receive consideration apart from any economy thereby effected.

There are three principal methods of calculating which claim to eliminate mental processes in varying degrees, and they are as follows -

(a) By rating, ready reckoner, and specially constructed tables.

(b) By slide rules.

(c) By calculating machines.

In considering calculating work all these methods should be investigated, for any of them may suit the particular job in view. Among the calculations to which these methods can be applied are discounts, interest, wages, percentages, costings, invoice extending and checking, foreign exchange work, dissections, timber calculations, apportionments, and scientific, surveying, actuarial and statistical calculations.

### **RATING AND READY RECKONER TABLES.**

The general utility of tables for calculations of all kinds is not recognized to any great extent by business men. A careful perusal of most of the tables now published demonstrates that some of the most complex calculations can be easily solved by their use, and for certain classes of work tables undoubtedly enable the result to be obtained quicker than any other method.

For short multiplications and divisions "Cotsworth's Tables," or similar tables, can be manipulated as quickly as most machines as they give a direct reading for the multiplication of three figures, or the division of four figures by three figures. They can also be used very advantageously for percentages. All calculations on machines have to be worked by decimals, and when dealing with British currency or measures

the operation is more complex than that of decimal systems. It is generally found expedient to use tables with calculating machines so as to convert shillings and pence into terms of decimal of a £, although these conversions can be dealt with by a rule of thumb. Tables are generally supplied by the makers of the machines, but it is often advisable to construct special tables for certain classes of work. Another exceedingly useful form of table for use with a calculating machine is a table of reciprocals, which enables division to be worked as multiplication where a constant divisor runs through a series of items.

All firms having any kind of calculating work are strongly advised to consider the possible use of tables—either using one of the many books of tables now published, or by having them specially constructed. It is necessary, however, to check calculations performed on tables in the same way as if done mentally or by machines, as there is a liability to error in reading or copying. For some years several railway companies have utilized tables for the great bulk of their calculating work, and the economies effected even over machines is considerable. It is impossible to indicate fully the many uses to which tables can be applied, but the following list of calculations that can be made by means of tables already published will show the great variety of purposes for which they can be employed.

General ready reckoners.

Wage reckoners at all rates per hour.

Metric conversion tables.

Costing, bonuses, discounts, interests, etc.

Profit and pricing.

Prices for goods sold by weight, etc.

Foreign money exchange tables.

Cubic and square calculator.

Health Insurance tables.

Pricing tables, etc., etc.

Another form of table which is of special utility is the FLAP table. These tables are specially constructed for the

work to be handled, and it is even possible to use them for timber costing. Most examples of this form of table give a direct reading, but some of the more complicated problems are handled by using logarithms, and by a second reading in the de-logrizing column the result is obtained. It may be mentioned that no knowledge of logarithms is required to use these tables. The inset shown here is a table constructed by Mr. Elsdon in which the half-yearly dividend at 3 per cent. per annum, on any sum of money, less income tax at 6s. in the £, is obtained by direct reading. The first item in each square represents the amount of dividend, the second the income tax, and the third the net amount payable. This table is used by many firms in making out the dividend warrants, and if the amount of stock held is written on the warrant, the counterfoil and cheque can be made out by the typist from the table.

It is noteworthy that nearly all figure tables are compiled with the aid of mechanical calculating machines (which are separately dealt with further on), and that many firms make use of calculating machines to construct their own tables, according to their particular requirements. Many tables can be so compiled in a few hours which would otherwise require weeks, or even months, of laborious mental effort and concentration. It also ought to be mentioned that some tables which profess to give final results, may be limited in two senses: firstly, in the extent to which they reach, and, secondly, because large quantities are given in round numbers, and broken amounts are arrived at by introducing mental addition of, perhaps, two or three items from the same book. There are other tables which only give what may be termed key figures for the purpose of finding a basis for multiplying and dividing in order to arrive at certain results, and such tables as these are particularly useful in connection with mechanical calculating machines. A very good example of this kind of key figure table is James Robertson's *Dictionary of International Commercial Quotations*. For example: a figure taken from this book representing the value of one

metre in, say, francs and centimes will, when multiplied on a calculating machine, give the equivalent value of 1 yard in £ s. d. at any rate of exchange which is obtained by selection from the book

### SLIDE RULES.

Slide Rules are instruments by which logarithmic calculations can be performed mechanically, and quite a considerable number are used on business calculations. For certain classes of work, *e.g.*, where the figures handled are fairly small and where the results are not required to be carried out to minute accuracy or where values are not involved, they are particularly suitable and can be operated faster than many calculating machines. There are many forms of slide rules on the market, and it is impossible to say that any one is best for general purposes, for it is necessary to use one of a capacity that will cover the particular purpose in view. The form now on the market in which the scales are engraved on white celluloid instead of on box-wood, enables the readings to be taken more quickly and accurately. Another form in which a very large scale is got into a handy compass is the FETTER spiral or cylindrical slide rule, and many firms employ this for costing, percentages, etc., as it admits of reading four or five figures

### ROULEAU CALCULATOR.

The Rouleau Calculator is really a mechanical adaptation of the slide rule to a machine, although it possesses very little mechanism. An aluminium cylinder is mounted on a stand and a form section constituting a slide passes over the cylinder. The rotation of the cylinder is performed by turning a knob on the left, whilst the slide is moved over the cylinder by means of small buttons. The setting of the figures and the readings are therefore much faster than on the ordinary slide rule, and as the machine is equivalent to a flat slide rule of 60 ft. length, in certain calculations it is possible to read five or six figures accurately.

## CALCULATING MACHINES.

There are now on the market almost as many different kinds of calculating machines as there are typewriters, but, like typewriters, only a few have obtained a wide popularity. Calculating machines may be divided into three types—key operated, crank operated, and a combination of both.

### KEY OPERATED CALCULATORS.

The Comptometer and the Burroughs Non-Lister are the most popular of this type and are suitable for all classes of calculations. This type of calculating machine possesses one salient advantage over other machines in that it can be used for all the four rules of arithmetic. For practical purposes, crank operated calculators are useless for addition, and also listing machines are impracticable for multiplication and division. The introduction of the controlled key on the Comptometer eliminates entirely the element of error arising from imperfect depression of the keys, and it therefore makes the Comptometer unique as a key operated calculator. The controlled key is so effective in securing accuracy and speed to the operator, through confidence in its efficacy, that its value should be fully realized.

The theoretical principles involved in calculating with the Comptometer are simply that the four cardinal operations of arithmetic are performed as variations of simple addition. Addition is purely and simply the function of the Comptometer, but the mathematician will readily appreciate that subtraction, multiplication and division are disguised forms of adding. Thus, to multiply six by five the 6 key is depressed five times, and with larger numbers the multiplicand is depressed a certain number of times for every digit of the multiplier. It is not proposed here to describe in detail the methods by which any mathematical calculation can be performed on the Comptometer, but rather to indicate to firms now requiring the machine only for adding that the Comptometer is an efficient calculating machine. Further, the operation of the machine does not require a knowledge of

mathematics, and speed of operation follows practice. The average clerk can, at the end of an hour's practice, multiply at least six times as quickly on the Comptometer as he could mentally, and many clerks could work ten times as fast with accurate results, which they could not undertake to give mentally.

In addition and division the utility and speed of these machines are not fully appreciated until the operator has acquired, by practice, a certain amount of skill. Like the typewriter, the non-listing machine requires practice to enable one to operate it rapidly, and to obtain the full benefit of its potential speed: but when it is correctly operated with the proper fingering, the Comptometer, as an adding machine, is infinitely faster than any other known method or device, and is as fast as, and in some cases faster than, the crank operated machines for multiplication and division. When installing a Comptometer it is always advisable to employ a trained operator, or to have one of the staff properly trained by the Comptometer Company; for although the actual tuition only takes a few hours, the advantage of training is that the whole field of commercial arithmetic is covered, and the operator is taught to perform every operation in the quickest possible way. If, as is frequently found to be the case, a Comptometer is installed for the use of all the clerks in the office, the full value in speed of the machine is not obtained; for, obviously, in a machine requiring dexterity of operation, a clerk who uses the machine only occasionally does not obtain from the machine the advantages that a whole-time operator gains. This point is particularly mentioned, for it is undoubtedly an essential point to be considered when considering the installation of a non-lister especially for calculating work.

### CRANK OPERATED CALCULATORS.

The crank operated machines may be divided into two types—the horizontal and the vertical. It is proposed to describe the Madas for the former and the Bruns-viga for the latter, but it is not suggested that these two machines are

the best of those types, but rather that a description of them will cover most machines of their type.

Most of the machines of this class weigh only a few pounds and can be operated on the desk and transferred from clerk to clerk. The *modus operandi* is so simple that anyone of ordinary intelligence can use the machine after ten minutes instruction, and proficiency and top speed of operation can

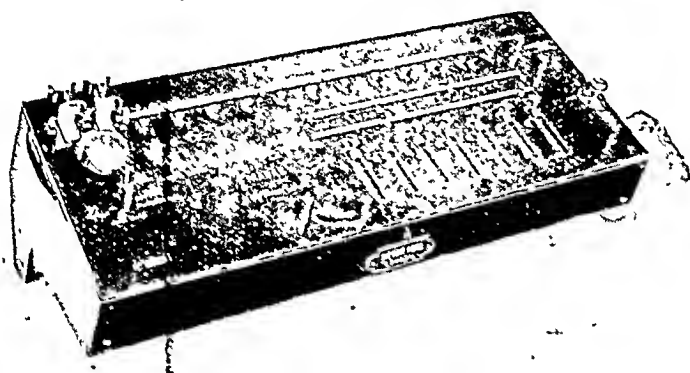


FIG. 4  
MADAS CALCULATOR

often be attained in an hour. The operation of the machine merely consists of moving the levers or buttons on the dials, turning the handle, and sliding the carriage. All makes of these machines are supplied in varying sizes and types, are constructed to suit all classes of work, and are unlimited as to the kind of calculation that can be performed, though the crank operated calculator cannot be considered a practical adding machine.

The most popular machines of the horizontal type are the Madas, Tim, Layton's Arithometer and the Archimedes.

The above photograph of a MADAS machine embodies all the devices and improvements of the horizontal type of machine, plus an automatic dividing mechanism. In doing an ordinary multiplication, say,  $7,642,892 \times 7062$ , the larger figure would be set on the buttons at the bottom of the

machine and the handle turned twice in the first column, the top slide stepped one space, the handle turned six times in the second column, the top slide stepped two spaces, and the handle turned seven times in the fourth column. The number of turns of the handle in each column, *i.e.*, 7062, would be shown on the lower row of figures on the top slide, and the result of the multiplication on the top of the slide. Thus when the sum is completed all the factors or figures used in

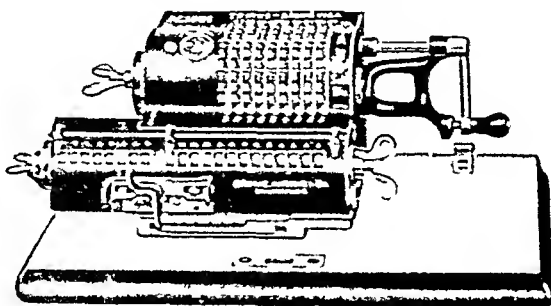


FIG 5  
BRUNSVIGA

the calculation are visible. This sum could, of course, be worked in a few seconds.

In dividing, the divisor is set out on the bottom buttons and the dividend on the top slide. By moving a lever at the side the operation of the machine is reversed, *i.e.*, changed from addition or multiplication to subtraction or division. In the horizontal type of machine this brings a second set of calculating wheels into operation, thereby halving the wear and tear as compared with machines on which division (or a minus turn) is effected by reversing the handle. The divisor is subtracted from the dividend by turning the handle in each column, but in all types except the Madas it is necessary to watch the operation carefully, for only a certain number of subtractions or turns of the handle can be made for each column and the carriage must be moved along by hand. In the Madas, however, division is accomplished merely by turning the handle until the carriage has travelled along



to the number of places of decimals required in the answer. This device eliminates the necessity of mental work, obviates moving the carriage for each column, and makes division absolutely a mechanical process.

In the BRUNSVIGA, or vertical type of crank machine, the *modus operandi* is very similar but the turn of the handle is different. The handle has a two-way action—forward for multiplication and backward for division. "Overturns" of the handle are therefore corrected more readily than on the horizontal crank machines, but the single set of calculating wheels in this type of machine has to bear all the strain. This class of machine is slightly heavier in operation, but the wearing qualities of the Brunsviga have been found to be very good.

#### THE KEY AND CRANK OPERATED MACHINE.

In calculating machines there have always been two schools of thought—the European favouring the crank operated, and the American the key operated. It has, however, been considered by many that the ideal machine would embody the principles of both, and in the Millionaire and the Monroe machines the features of both have been incorporated, though these two machines are not similar in construction or mode of operation.

#### THE MILLIONAIRE.

This machine can be operated either by a crank or by an electric button, though the latter is the more popular since it is much quicker and quieter, and also eliminates all physical effort. The MILLIONAIRE differs fundamentally from all other machines in that it does actually multiply by any digit with only one turn of the crank, or one depression of the electric button, whether a digit be 1 or 9. That is to say, it does not achieve the results of multiplication by a process of addition. To put the matter very simply, it gives by one movement for instance, that 6 multiplied by 6 equals 36, instead of by the method of adding six separate sixes together, involving

six movements. It is not suggested that anyone would use a calculating machine to multiply any one digit by another, but the process holds good for any number of figures running into many millions or decimal places. The Millionaire also divides, and where addition or subtraction are part of a formula it will also embody these incidental functions. It can

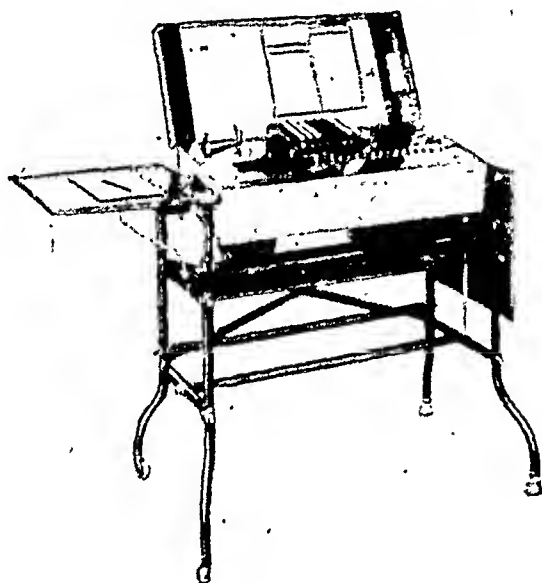


FIG. C  
MILLIONAIRE

also perform compound multiplication, *i.e.*, the adding together of products simultaneously. The operation of this machine is entirely automatic and consists of entering the multiplicand in one register by depressing keys, and as each figure of the multiplier is entered in a second register by the depression of an electric button, the product is simultaneously produced in a third register.

The method of operation of the machine can be completely acquired in less than half an hour, so that a machine in any office is as useful in the hands of one person as in the hands of another. Though the cost of the Millionaire machine is much higher than that of any other calculating machine, its

capacity and special features are consistent with the price when the volume and character of the work justify its use.

### THE MONROE.

The MONROE is a combination of a crank operated calculator and an adding machine. For calculating work the numbers are set on a keyboard very similar to that of the Comptometer or Burroughs, and the calculations are performed by means of

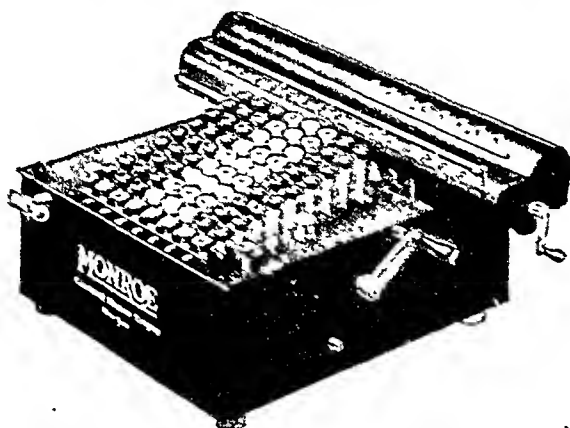


FIG. 7  
MONROE

the crank at the back. This crank has a two-way mechanism movement (similar to the Brunsviga)—a forward movement adding or multiplying and a backward action subtracting or dividing.

This machine is practically the only crank operated calculator which can be used as an adding machine, although, as there is no £ s. d. model its use for adding is limited. It possesses several distinctive features which ensure accuracy of work, e.g., a positive motion carriage shift which "steps" the slide from column to column, and it is impossible to make an incomplete depression of the keys. Unlike a key operated calculator it is not necessary to depend upon specially trained operators, and the setting of the numbers by keys is naturally quicker than the setting of levers on the "Brunsviga" or "Madas" type of machine.

## READY RECKONER, RATING TABLES, ETC.

Gall & Inglis, 31 Henrietta Street, London, W.C.2  
 Frederick Warne & Co., Bedford Court, Bedford Street, London, W.C.2  
 John Gibson, 53 Coleman Street, London, E.C.2 (COTSWORTHS, etc.)  
 C. H. Elsdon, 48 Empress Avenue, Ilford. (FLAP TABLES.)  
 Robertson Rapid Calculating Machine Co., Ltd., 140 Bath Street,  
 Glasgow.

## SLIDE RULES.

FULLER CYLINDRICAL SLIDE RULE. W. F. Stanley & Co., Ltd.,  
 286 High Holborn, London, W.C.1  
 PILCE-WORK WHEEL CALCULATORS. Smith, Davis & Co., Amen  
 Alley, Derby  
 ROULEAU ROTARY SLIDE RULE. M. L. Gordon & Co., 9 St. Martin's  
 Court, Charing Cross Road, London, W.C.2.  
 Any dealer in mathematical and drawing instruments.

## CALCULATING MACHINES.

*Key Operated—*

BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street,  
 London, E.C.4.  
 COMPTOMETER. Herbert E. Robbins, Ltd., Imperial House, Kingsway,  
 London, W.C.2.

*Crank Operated—*

ARCHIMEDES. Gilbert Wood, 75B Queen Victoria Street, London,  
 E.C.4.  
 BRUNSVIGA. J. Miller, 48 Clerkenwell Green, London, E.C.1.  
 GUY'S. Guy's Calculating Machine, Ltd., Truro Works, Truro Road,  
 London, N.22.  
 LAYTON'S ARITHOMETER. C. & E. Layton, 56 Farringdon Street,  
 London, E.C.4.  
 LEHIGH. The Lehigh Corporation, 25 West 43rd Street, New York.  
 MADAS. Gilbert Wood, 75B Queen Victoria Street, London, E.C.4.  
 MARCHANT. C. Beveridge, 112 Queen Victoria Street, London, E.C.4.  
 MULDIVO. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria  
 Street, London, E.C.4.  
 TIM. George Spicer, Market Place, Bedford.  
 TRIUMPHATOR. C. Beveridge, 112 Queen Victoria Street, London,  
 E.C.4.

*Key and Crank Operated—*

MILLIONAIRE. Gilbert Wood, 75B Queen Victoria Street, London,  
 E.C.4.  
 MONEOL. The National Office Equipment Co., 61 Queen Victoria  
 Street, London, E.C.4.

### CHAPTER III

## BOOK-KEEPING AND ACCOUNTING MACHINES

General Remarks—Burrighs Pay Roll Machines—Elliott-Fisher—  
Invoicing and Billing Machines—Adding Typewriters.

THE necessity for efficient book-keeping has been more and more acknowledged in recent years, but often business men feel that the cost of collecting further information which would prove of great utility to the administration of the concern would be greater than the data would be worth. It is asserted, however, that many firms are suffering because of their inefficient book-keeping, and bankrupts often admit that their insolvency was caused by insufficient book-keeping or reliance on the annual balance sheet. If the book-keeping is effective it should provide a daily record of every activity of the business, and consequently should afford a means for the exact control of prices and conditions. Efficient management requires statistics in order that the maximum progress may be accomplished to achieve the maximum business. To assume that to learn the facts of your business is expensive, and that the data afforded does not justify the cost, is to admit an ignorance of modern methods, although this opinion has been very widespread in all spheres of business. A careful enquiry into the reasons for the success of some of the largest concerns in this country shows clearly that it has been due in a great measure to the information which is periodically collected by the management as to the exact working of each department, and that the cost of supplying even the most detailed information to the executive is very small because modern methods and appliances are employed in the offices. Book-keeping by typewriters and other machines may surprise many, but in many of the largest firms the whole of the book-keeping is now done on machines. The machines will post ledgers, make statements, make up pay rolls, make

[illegible]

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CHECK NO.	WEEK ENDING	CHECK NO.	WEEK ENDING
81	10 6 7	85	10 6 7
GROSS WAGES	5. 4. 2	GROSS WAGES	4.10. 0
LESS		LESS	
SAVINGS BANK		SAVINGS BANK	5 0 =
WORKS SOC. PT. II	6 =	WORKS SOC. PT. II	6 =
HOSP. & BENEF.	3 =	HOSP. & BENEF.	3 =
INCOME TAX	2. 0 =	INCOME TAX	5. 0 =
MT. INS. SICKNESS	4 =	MT. INS. SICKNESS	4 =
UNEMPLOYT.	2½ =	UNEMPLOYT.	2½ =
NETT WAGES	5. 0.10½ =	NETT WAGES	3.18 8½ =
SIGNATURE		SIGNATURE	
CHECK NO.	WEEK ENDING	CHECK NO.	WEEK ENDING
83	10 6 7	103	10 6 7
GROSS WAGES	5. 8. 2	GROSS WAGES	2.19. 9
LESS		LESS	
SAVINGS BANK	4. 6 =	SAVINGS BANK	
WORKS SOC. PT. II	6 =	WORKS SOC. PT. II	6 =
HOSP. & BENEF.	3 =	HOSP. & BENEF.	3 =
INCOME TAX	2. 6 =	INCOME TAX	2. 0 =
MT. INS. SICKNESS	4 =	MT. INS. SICKNESS	4 =
UNEMPLOYT.	2½ =	UNEMPLOYT.	2½ =
NETT WAGES	4.19.10½ =	NETT WAGES	2.16. 5½ =
SIGNATURE		SIGNATURE	

FIG. 9

PAY ROLL SLIPS PREPARED ON BURROUGHS

out invoices, and extract balances. Book-keeping is thereby reduced to the simple process of inserting the necessary sheets into the carriage of the machine, depressing the keys for the amounts, etc., and the details are printed and added *on the sheet by the machine*. *Certain safeguards are provided* to check the mechanical operation, and each amount added or subtracted is visibly recorded in a totalizer. The Burroughs make a machine which is largely used in banks for posting current ledgers, and the balance of each account is automatically given after each posting.

*The pay roll* is a very important item in the counting-house of a large firm, and in many firms it represents the greater part of the outgoings. It must be accurate, for mistakes on a pay roll would not only be very costly and cause distrust of the counting-house by the employees, but are often untraceable. Yet the handwritten mentally cast roll is found in some of the largest firms. The Burroughs Adding Machine Company recently conducted an investigation into the handling of pay rolls in 475 firms, and in spite of the different conditions that existed in the various offices, it was found that a considerable economy, amounting on an average to about 45 per cent., was effected over the mental method in firms where the Burroughs was used. Every accounts branch recognizes that the compilation of the pay roll and the actual payment of the employees form a considerable part of their work, and unless done very carefully often occasion serious errors. If the application of machinery to this class of work simplifies and reduces the cost it should receive consideration. The Burroughs machine is adaptable to nearly all methods, and where a complicated clock card system is in use it can be employed with much saving of time and the reduction of errors to the very lowest possible limit.

On pages 24 and 25 a slip pay roll system is illustrated, and the making out of the slips in duplicate together with the loose-leaf pay roll record is wholly accomplished on the Burroughs machine.

The International Money Machine is a special pay roll



machine which prints the amount on the pay envelope and at the same time on a list. In the one operation, the correct number and denomination of the coin to make up the amount listed are scheduled. All these operations are performed as one and automatically. It lists, adds, and denominates the pay roll. Sterling models of the machine for British currency are not yet available.

It is obviously impossible to eliminate entirely ordinary hand book-keeping in all spheres of business, though the machine enthusiasts assert that all book-keeping is machine work; it is, however, noteworthy that when firms adopt machine book-keeping, they never return to the old method. It is well-known that quite the greater part of the accounting consists in the handling of large cumbersome books, the searching for the page, the insertion of the items, blotting, etc., which occupy a large amount of time, while errors in copying are made and occasion an inordinate waste of time to rectify.

### THE ELLIOTT-FISHER.

The Elliott-Fisher is a very widely used book-keeping machine, and offers the means of performing every operation in any class of book by machine. The Burroughs method of book-keeping described above does not enable the matter to be itemized nor does it allow any text, except a few set terms, to be written up; further, if it is necessary to record into bound books the Burroughs machine cannot be used. The Elliott-Fisher consists of a flat stationary bed over which operates a typewriter with adding and other special attachments. When the actual books, or the loose-leaf sheets of the books, or the invoices, are placed on the flat bed of the machine, the typewriting mechanism can be moved about and the text and figures inserted at any desired point on the sheet. The flat bed of the Elliott-Fisher makes it a splendid manifold, and also enables the machine to write into bound books, loose leaves, cards, etc., of any dimensions. The Elliott-Fisher posts to the ledger and simultaneously writes

out the statement with the totals inserted, which obviously effects a great economy over the hand method. In posting into a loose-leaf ledger it is not necessary to remove the pages from the binder, and the statement or other duplicates can be obtained at the same operation.

The adding registers which are fitted automatically collect

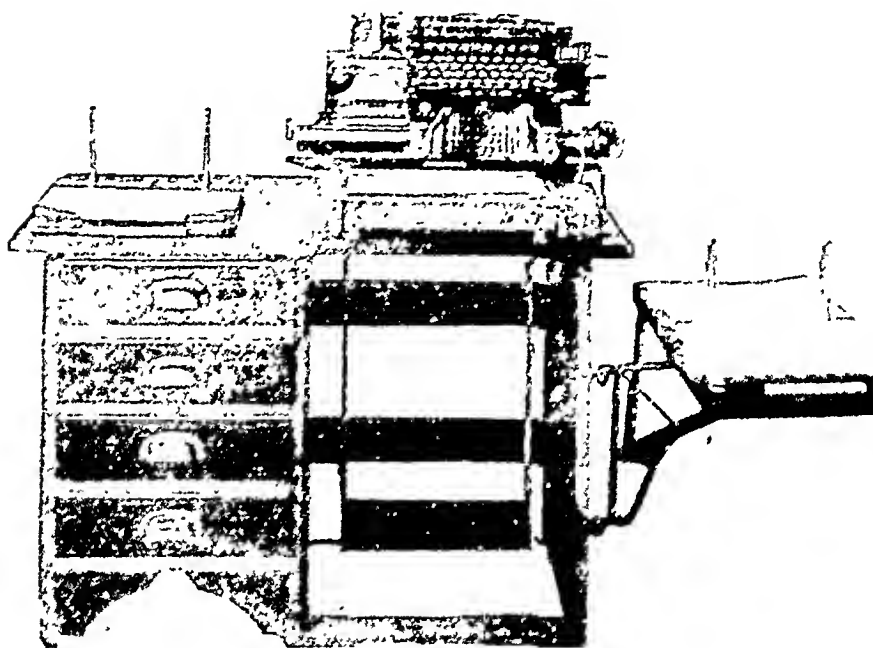


FIG. 10

ELLIOTT-FISHER

the figures to be totalled. Each register records only the figures typed in its particular column, and although it is a fixed part of the machine it can be made operative or inoperative by means of a lever. A number of registers are fitted and quantities, weights, and currency can be registered.

The most recent improvement in accounting machinery is the Cross-adder. This adjunct to the machine adds or subtracts across the columns as well as vertically, and at the end of each line the total is printed, and if the entries have been correctly typed the Cross-adder automatically clears. This

machine is used on accounts receivable and payable, stock accounting, and pay roll work.

Book-keeping by machinery is now done by some of the largest firms, and the machines undoubtedly justify their installation, but it is not asserted here that all accounting should be done by machinery. It is obviously impossible to lay down any general rule as to what classes of book-keeping are best done by machines, for the nature of the business and the size of the concern must be taken into consideration, so that every counting house must be considered on its merits. It is highly improbable, however, that a machine would justify its installation in the case of a small set of books which are now kept by, say, one book-keeper part time, but the use of the machine would certainly enable the clerk to give time to other and perhaps more important work, especially if it were also used for order writing and invoicing. Other machines used considerably for book-keeping are specially built typewriters with adding attachments. See Wahl attachment below, and the Underwood Book-keeping machine.

## INVOICING AND BILLING MACHINES.

In large concerns the orders are generally passed to the Order Department. After they are sorted and perhaps entered into a register they are passed to the "Billing Clerks." The typewriter with special attachments, or the Elliott-Fisher, is now almost universally used for "billing," as it enables all the necessary records to be written at the same time, and each record is, of course, the same, thus securing uniformity and accuracy of work. The "billing" may consist of producing a copy of an order for the factory or warehouse, the sales-manager, the cashier, the loose-leaf sheet of the Day Book, and for any other department of the business; also the customer's advice and the addressed wrapper or label may be included. Simultaneously with the making out of the orders the machine will collect the figure items and add them so that the totals can be inserted where necessary.

THE WAHL ADDING-SUBTRACTING ATTACHMENT. The typewriter and adding machine have long occupied two important positions in the office, but although they can be regarded as necessary twins they have not overlapped in

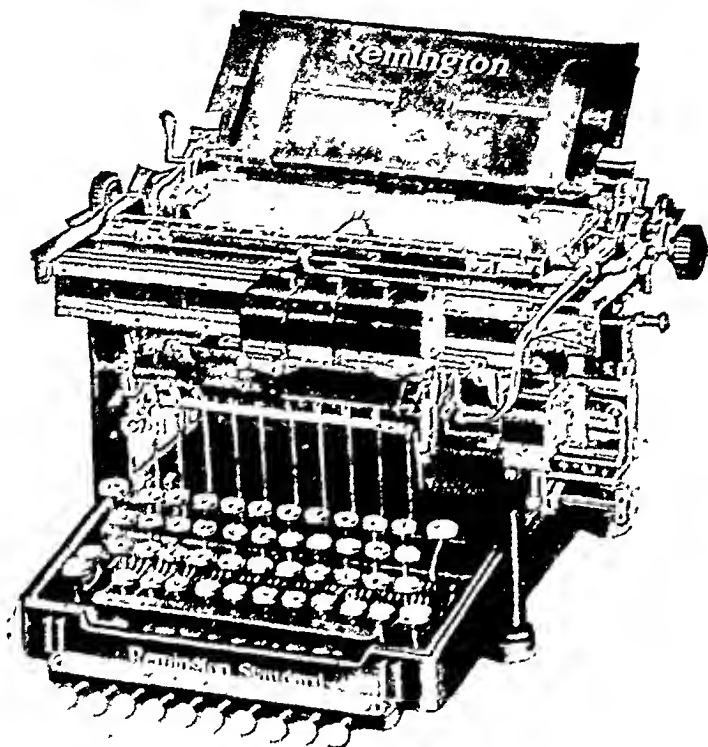


FIG. 11

REMINGTON WAHL

their functions, although the work which they each perform overlaps. They have really been required to work side by side, since the ordinary typewriter does not add and the adding machine does not write. The adding attachment, which can be built in certain makes of typewriters, enables figures that are typed into various columns, etc., to be added or subtracted. The process of typewriting does not require to be modified in any way, and a number of safeguards are

included which make the machine almost "foolproof." The totalizer can be set to any point along the carriage, and if it is desired to add in a number of columns simultaneously, an extra totalizer will be required for each column.

It is not suggested that the Wahl attachment on a typewriter makes a perfect adding machine for adding work pure and simple, but for all classes of invoicing, accountancy, and book-keeping, where it is necessary to itemize amounts or to insert any text, it certainly enables such work to be performed in one machine with great saving of time and gain in accuracy.

THE TYPE-ADDER is an adding machine attachment, so made that it can be readily attached to and detached from any standard keyboard typewriter. The device works independently of the typewriter mechanism, and does not interfere with the usual work done on the typewriter. It is claimed that the Adder, when attached to a typewriter, is capable of making cross-additions or vertical additions and additions in any way, putting the total where required. Sterling machines are not yet available.

THE ELLIOTT-FISHER INVOICE-ADDING MACHINE is also particularly adapted for "Billing." The flat stationary bed of the machine possesses exceptional manifolding powers and enables a large number of duplicates to be made at one writing. By using a number of forms arranged in the same registration—the machine rigidly holding the forms while being typed—a large amount of detail work can be concentrated into one operation.

#### BOOK-KEEPING MACHINES.

BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.

ELLIOTT-FISHER. Elliott-Fisher Co., 10 Queen Street, London, E.C.4.

ELLIS. Ellis Adding Typewriter Co., Newark, New Jersey, U.S.A.

INTERNATIONAL MONEY MACHINE. International Money Machine Co., Reading, Pa., U.S.A.

REMINGTON WAHL. Remington Typewriter Co., Ltd., 100, Gracechurch Street, London, E.C.3.

TYPE-ADDER. The Type-Adder Co., 465-469 Washington Street, New York.

UNDERWOOD. Underwood Typewriter Co., Ltd., 120 Queen Victoria Street, London, E.C.4.

## CHAPTER IV

### TABULATING MACHINES

The Hollerith System—The Powers System.

MODERN business methods necessitate the computation of an ever-growing amount of statistical and accounting data, and the importance of substituting mechanical for manual labour is more and more being realized by business men. The adding and calculating machines are so ubiquitous as to be commonplace, but the Hollerith and Powers tabulating machines are not so widely known.

At the outset it is not asserted that this class of machine is suitable for all accounting and statistical work, for much of such work undoubtedly can be performed more economically on the adding machine ; but where the data to be tabulated is of a complex nature, consisting of a number of factors that are required to be tabulated in a number of categories, the Hollerith or Power system is of special utility. The machines were originally designed by Dr. Hollerith to tabulate census figures, and have been used with enormous economies and much success on censuses of population, and for the statistics of the National Registration Act, 1915. But their adaptability for business purposes is rapidly becoming known and they are being profitably employed for costing work, sales analyses, insurance work, purchases accounts, and all forms of accounting and statistical work. The most economical use of the systems will be obtained by centralizing the statistical and accounting work of large concerns, for if it is possible to perform, in one office, the whole of such work of a large company operating over a wide area, the installation of a small battery of machines could be justified, whereas, it may be found that a single branch of the concern could not profit by the use of the machine.

## GENERAL PRINCIPLES.

It is not possible to convey a complete idea of the capabilities of these systems, but their fundamental principle is to record the information that it is desired to tabulate by punching holes on cards, which are thus rendered capable of mechanical manipulation.

The systems are operated by four distinct machines—

- |                   |                    |
|-------------------|--------------------|
| (a) The Punch.    | (c) The Sorter.    |
| (b) The Verifier. | (d) The Tabulator. |

## PUNCHING THE CARDS.

The punching of the cards is equivalent to entering the facts into books or on to cards by hand. The cards are specially designed of a standard size ( $7" \times 3\frac{1}{4}"$ ) with a series of figures in forty-five columns. These forty-five columns can be ruled and printed in any way to suit the data that is required to be assigned to any group of columns.

Fig. 12 (page 34) represents one form of card that can be used. This card is punched direct from the invoice, and all the various factors are coded by numbers. Thus the card reads as follows—

Year . . . . .	1913
Month . . . . .	January
Day . . . . .	10th
Invoice No. . . . .	40610
District . . . . .	1
Town . . . . .	210
Customer's Number . . . . .	603
Salesman . . . . .	37
Dept.. . . . .	10
Terms . . . . .	2
Commodity. . . . .	3075
Quantity . . . . .	100 lbs.
Unit . . . . .	1
Amount of Sale . . . . .	£100
Cost Price . . . . .	£60

It is, of course, not always necessary to utilize the whole forty-five columns, and the systems are so elastic that almost every class of record may be planned to come within the compass of the card.

Year	Mo	Day	Invoice No	District	Town	Cust No	Salesman	Ref	Commodity	Quantity	Unit	Amount of Sale	Cost Price
193	Jan	10th	40610	1	210	603	37	10	2	3075	100	1-103	\$100-0-0
													\$60-0-0
0	10	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	1	1	1	1	1	1	1	1	1	1
2	2	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	1	2	3	4	5	6	7	8	9	10	11	12	13

Fig. 12

PUNCHED CARD



The holes are perforated in the cards by means of a punching machine with a key or slide operated keyboard. The travel of the card from column to column is automatic. The rate at which the cards can be punched varies with the number of columns and the skill of the operator, and may range from 300 to 800 an hour. The punching of the cards is usually done by boys or girls, and accuracy and speed are attained after about two months' work. It is obvious, however, that the card must be accurately punched, and it is therefore desirable to check all punching in a verifying machine—the Hollerith and Powers verifiers differ very considerably.

### **SORTING THE CARDS.**

The next process is to arrange the cards in the necessary order, and this is accomplished by sorting the cards according to the holes punched in the various columns.

The photograph (Fig. 13) represents a Hollerith sorting machine. The power drive is electric, but in the Hollerith the whole of the mechanism is also electrical, the sorting being effected by electrical contact which takes place through the holes of the card. There are thirteen receptacles into which the cards are sorted, numbered 0 to 9, 11, 12, and "reject," and the openings to these receptacles are controlled by the holes in the card. Thus when all the cards having a hole punched at, say, figure 4 in a certain column are passing through the machine, they drop automatically into receptacle 4. The process proceeds one column at a time, but as the machine works at the rate of about 15,000 cards an hour it is obvious that the sorting right down of a considerable number of cards is soon accomplished. Thus, if a certain group of columns ran into six figures it would be necessary to sort six times, but if there were only a very small number it would be quicker to sort by hand. The data on the cards can be classified into any conceivable arrangement in the sorting machine. The capabilities of the Powers Sorter are exactly similar, but the sorting is done horizontally instead of vertically.

## TABULATING THE CARDS.

The tabulating or adding machines differ very considerably in both systems, although their functions are analogous, to

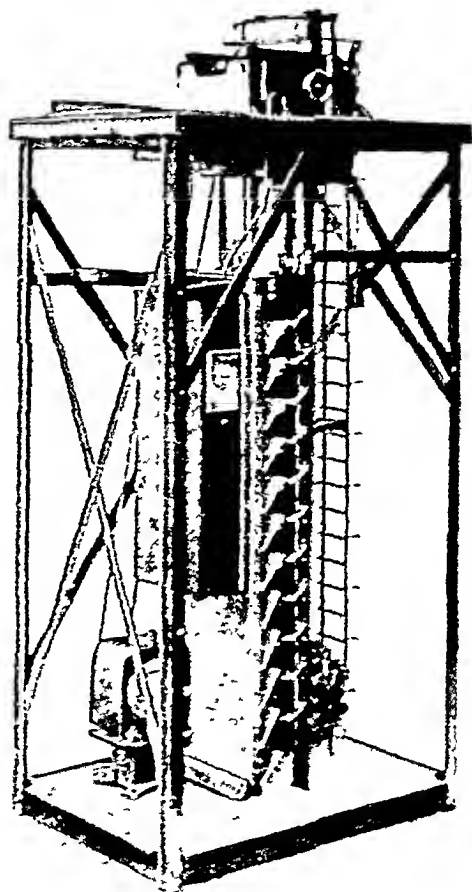


FIG 13

HOLLERITH SORTING MACHINE

obtain the totals of the various factors. Both machines will add all the groups of columns simultaneously, although there is generally no necessity to add columns that do not represent quantity or value, for it would be futile to add a group of columns that represent "description of article." The totals

can be obtained for any division of the cards. The Hollerith machines total 9,000 cards per hour, and if the five counters are being used this represents 45,000 items, while the Powers prints the items and totals 3,500 cards per hour, which with five counters means 17,500 items, or with seven counters means 24,500 items.

### HOLLERITH v. POWERS SYSTEM.

It is impossible to say that either system is better than the other. While the main principles of both systems are identical, each has special features and advantages which may or may not be of special utility to the work required to be done. Business men should therefore consider both systems, for it is not even possible to postulate that one system is particularly suitable for, say, costing. They are naturally rival systems, but the choice will generally depend on the form in which the data is finally required; in other words, the tabulator will usually govern the system adopted. For general consideration the punching and sorting can be regarded as equal on both machines, although if the work of punching is likely to be de-centralized the Hollerith puncher will be much more economical. For many purposes business experts have found that the ideal installation would be a combination of both systems, but the companies are naturally reluctant to this being done, although the fields of the cards are of the same gage and can therefore be worked in either machine. It is proposed, therefore, to set out very briefly both systems.

### THE PUNCHES.

The Hollerith Punch is a light portable machine, not power driven, and is sold outright for £20. There are two models of Powers punches— one key operated and the other slide operated— both being electrically driven. The type to be selected depends on the method of copying the data, but when it is copied on to the card in handwriting it is expedient to use the key punch. The Powers punch is not sold, but is hired at £33 per annum.

machine to the punch. The operator works as if punching the card, and if the second operation does not tally exactly with the first, the machine stops and the column in which the error occurs is at once located. Thus the check is purely mechanical and the rate of verifying is exactly the same as punching. In the Powers machine the cards are placed singly over a perforated plate under which is fixed an electric lamp, and a red light shows where the holes are wrongly punched. Thus the onus of the check is on the operator. The rate of verifying is about 85 per cent. of the punching. Further, the Powers verifier will not discover omissions to punch in any one column, unless 0's have been automatically punched.

### THE SORTERS.

The main difference in the two systems is that in the Hollerith the whole mechanism of the sorter and tabulator is actuated by electrical contact as against mechanical contact in the Powers. Both systems claim their principle to be the best, but this is not really an important point of detail. The Hollerith claims to sort at 15,000 an hour, while the Powers claims 18,000, but in practice both machines sort roughly at the same rate, for the Powers has a slightly greater tendency to jam. The Powers Company are, however, introducing a new sorter capable of higher speeds and without any tendency to jam. In both machines one column is sorted at a time, and the setting of the machines for the various "sorts" is roughly the same. In the Powers system a series of counters is connected with each receptacle, so that the number of cards of every "sort" is obtainable, together with a grand total.

### THE TABULATORS.

The Tabulators are undoubtedly the most ingenious machines of the "sets," and owing to the distinct and different capabilities of each they should receive the most careful consideration, for they will probably determine which system

is to be adopted. In the Powers system the holes on each card are translated into typewriting, and at the same time

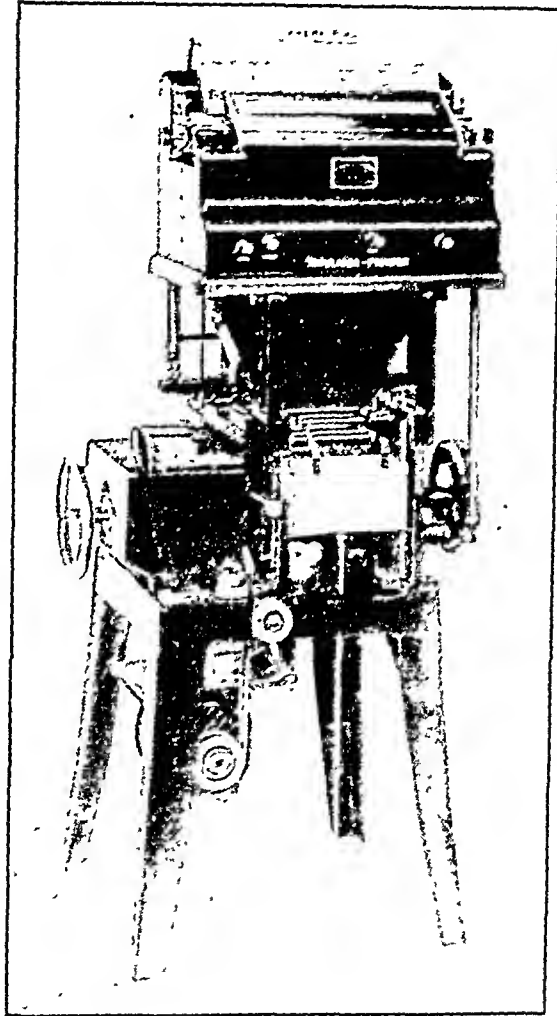


FIG. 15

POWERS TABULATOR

the groups that represent factors that can be totalized are added and the totals printed for each section. If totals only are required for each batch of cards, a button will eliminate the recording of every card on the typewritten sheet, and the

totals only will be printed together with the designation of the group to which the totals relate. Carbon copies are obtainable, so that a number of copies representing the details of each card with the totals of sections can be produced. All the fields or columns of card are printed simultaneously, and added if required, and further, when the sheet has been inserted into the carriage of the machine, the operator can leave the machine, and it automatically stops at the last card or at the end of the sheet. The speed of operation is 3,500 cards per hour. By the introduction of an alphabetical counter in the tabulator, which will be available shortly on the Powers machine, it will be possible to tabulate names, descriptions, etc., in letters instead of coding by figures as at present. This feature will be of great utility for certain classes of accounting work.

In the Hollerith system, the contact of the brushes through the holes in the card electrically operates the counting wheels in the counters, and the figures in the adding columns on the card are thus shown on the dials. The cards only require to be placed in the hopper and the machine will continue to show the cumulative totals of each group. If stop cards have been inserted between, say, each Cost No. (this can be done by the sorting machine), the machine will automatically stop at the end of each Cost No. when the totals can be written down and the dials zeroized. The operation of re-setting the counters to zero automatically starts the machine on the next run of cards. By means of what may be termed a telephone switchboard, fitted on the front of each machine, two counters can be made to run in unison, and if the total on one of these is allowed to run on whilst the other is set to zero, gross totals for the whole of the run are obtained. The speed of operation is 9,000 per hour.

In comparing the merits of the systems it is essential to consider the speed at which they operate. Speed is undoubtedly the essential end in view, for statistics lose a great part of their value if not produced quickly. Provided there is no gang punching to be done, both punches work at roughly

the same rate; but if there is a considerable amount of gang punching, the Powers would appear to have the advantage, although some users of both systems state that the speeds are roughly the same. The merits of the sorting machines are similar, and the slightly faster rate of the Powers is nullified by its greater tendency to jam, though in the future models the Powers may be the better sorter. The Hollerith verifier is faster than the Powers, and being a mechanical check is not subject to the human element. The greatest difference is with the tabulators. In the Powers system the cards are translated, printed, and added at 3,500 per hour, while by the Hollerith they are translated and added at 9,000 per hour. In the Hollerith it is therefore necessary to stop in order to write down the figures, but for some classes of work this time is equivalent to placing, and afterwards taking out, spacing, and totalling cards at the end of each group in the Powers system. In the Hollerith, therefore, there is a risk of error in copying, and the responsibility being with the operator the written totals cannot be regarded as absolutely accurate. Except on very long runs, the operative speed is reduced by copying totals, whereas on the Powers the nominal speed of the machine is also its operative speed. If one or more printed records are required of the translation of each card, the Powers system must be adopted; but if only totals are required, the superior speed of the Hollerith for long runs is an important consideration. The proposition is, therefore, whether it is expedient to sacrifice speed in order to obtain a printed result; but the comparative speeds of the two tabulators must be considered in relation to the work, as the nominal speeds are not necessarily the operative.

None of the machines of either system, except the Hollerith Key, Gang and Verifying Punches, can be purchased, but they are hired out to users at a monthly or yearly rental. The working costs of the machines are fairly high, but the increased output of work, the rapidity with which statistics can be furnished, and the saving in staff and accommodation to be effected by their use have been demonstrated by numbers of

the largest firms. The machines can be applied to the general accounting and book-keeping system of the business, and are of special use in the important phase of accounting cost keeping. The systems are undoubtedly capable of enormous development as they permit of great adaptability for statistical and accounting data.

It should be noted that both companies undertake all classes of statistical and accounting work for firms, the extent of whose operations could not justify the installation of these machines.

#### TABULATING MACHINES.

HOLLERITH. The British Tabulating Machine Co., Ltd., 2 Norfolk Street, Strand, London, W.C.2.

POWERS. The Accounting and Tabulating Corporation of Great Britain, Ltd., 57-58 Chancery Lane, London, W.C.2.



## CHAPTER V

### ADDRESSING AND DESPATCHING MACHINES

General Remarks—The Addressograph—The Elliott—The Addressall—The Speed-o'-Feeder—Folding Machines—Stamp Affixers—Envelope Sealers—Envelope Filling and Sealing Machines—Addressing of Parcels and Cases—The Diagraph—Parcel Sealers.

OWING to the growth of direct mail advertising, the periodical issue of lists to customers and dividend warrants to shareholders, the centralization of the administration of large concerns and the consequent necessity to write to the same persons frequently, the question of addressing becomes a proposition which involves a large amount of clerical labour if it is performed in the usual way by writing or typing. Further, the two greatest media of advertisement are undoubtedly the Press and the Post, and the latter form of publicity has grown to a considerable extent during the last ten years. No one doubts the efficacy of advertising by post and of following up customers with price lists and circular letters. But to justify the expenses of circularizing it is necessary that the work shall be performed as cheaply as possible, consistent with effectiveness. In firms where a large amount of repeat addressing has to be done the addressing machine is almost indispensable, for it is unnecessary to point out the amount of time which would be wasted in frequently addressing envelopes to the same set of persons by writing or typing at, say, eighty an hour, when machines are available which will print addresses at 2,000 an hour without errors or omissions.

In almost every kind of office an addressing machine can be used with great advantage when communications are frequently sent to the same set of persons, and in firms where a very large amount of circular matter is issued, which, of course, entails addressing, folding, filling, and sealing, the introduction of modern addressing and mailing machinery

would effect the saving of much clerical labour and the despatch of the mail would be facilitated. The utilization of machinery for mailing eliminates much of the monotony of this class of work, and effects efficiency and speeding up of output. In the wholesale trading concern, it can be used for addressing price lists, stock notices, etc. ; in the stockbrokers office, for advising regular clients ; in the publishing house, for addressing the wrappers to subscribers ; in the secretary's office, for addressing notices of meetings and agenda to

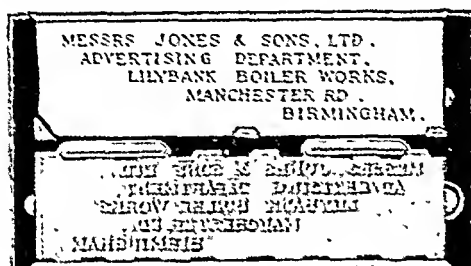


FIG. 16  
ADDRESSOGRAPH PLATE

members ; in the shipping office, for addressing sailing lists and cards, etc.

The most popular addressing systems on the market are the ADDRESSOGRAPH, the ELLIOTT, and the ADDRESSALL. The principle of the Addressograph is to emboss the name and address of each person upon a small zinc plate, which fits into the lower part of a tinplate frame. The embossing is somewhat similar to the penny-in-the-slot name plate machine, which may be seen at railway termini, etc., with the exception that the letters are negative and the operation of the machine is much quicker. An impression of the address plate, printed on a small card, is inserted in the upper part of the frame and forms the identification card of the plate. These plates are stored in metal drawers and can be used as an index, since they can be filed exactly on the same lines as a card index. When it is necessary to address any list or part of a list, the contents of a drawer are placed into the hopper or magazine

of the printing machine, and the plates pass through to the printing point where the envelope is inserted. A photograph of an Addressograph plate is shown on page 45.

The embossing of the plates is generally undertaken by the Addressograph Company at a cost of 2d. to 3½d. each.

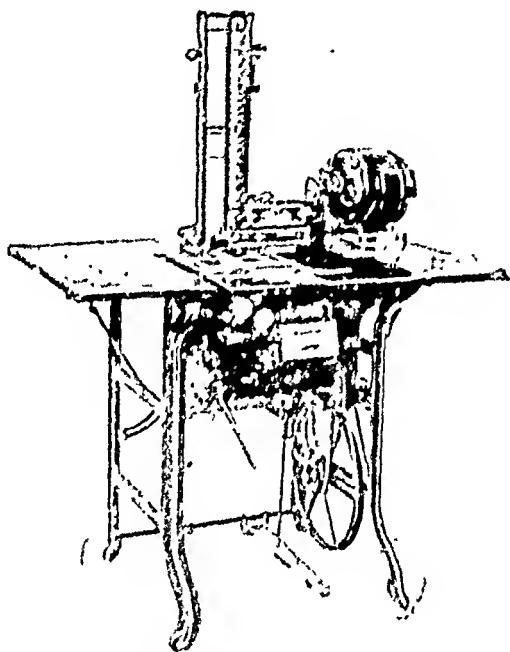


FIG. 17

ADDRESSOGRAPH PRINTING MACHINE.

If, however, the machine is to be operated on a large list of names, it is more economical to instal an embossing machine—the Graphotype—as the necessary alterations and additions to a large list would be sufficient to keep it in fairly constant use. The address plates are almost indestructible, and will print tens of thousands of addresses without wearing out.

One salient advantage of the Addressograph system is that the plates can be corrected by stamping the old name and address flat and re-embossing. When a name is deleted from a register the plate can be used for another name; it will,

therefore, be seen that the cost of material for the upkeep of the register after it has been formed is almost negligible. Fig. 17 is a photograph of the electric model, but a hand operated machine is also supplied.

In the ELLIOTT system a stencil for printing is made by punching out the letters, etc., from a manila fibre sheet

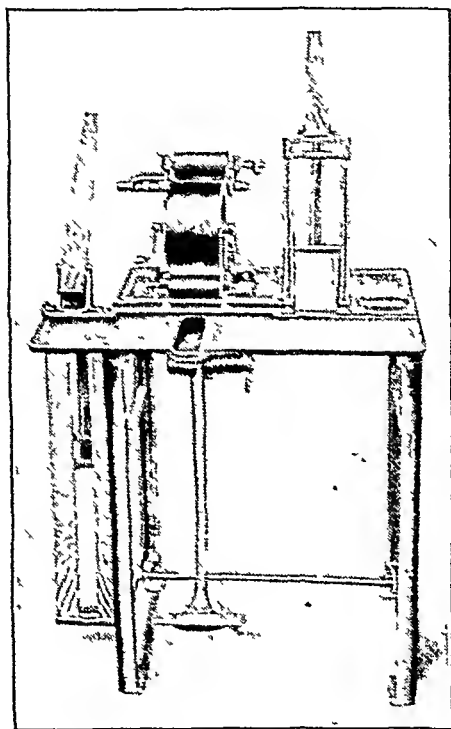


FIG. 18  
ELLIOTT MACHINE

which is held in a heavier fibre frame, and the machines for cutting the stencil are supplied to work by hand, treadle, or electric power. It is necessary to use strips of thick paper as a bed on which to cut. Another form of Elliott stencil can also be made in an ordinary typewriter. In the printing machine the stencils pass from right to left, instead of from rear to front as in the Addressograph.

In the ADDRESSALL system, which has been widely adopted by some of the very largest concerns having a total of nearly a million addresses, all the stencils are cut in an ordinary typewriter. The stencil consists of a sheet of specially prepared

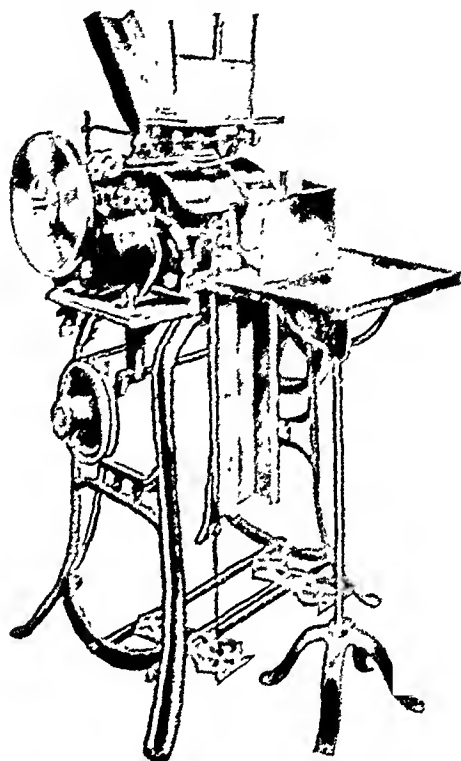


FIG. 19  
ADDRESSALL.

which will automatically take the paper from a roll, print the name and address and certain other information, if necessary, and cut the wrapper from the roll to any desired length. This machine will address and cut from 8,000 to 10,000 per hour. The ordinary model operates at about the same speed as the Addressograph or Elliott.

Before adopting any system it is desirable to consider all these machines, since the initial cost and the maintenance of each system will vary according to the size of the list which it is proposed to operate.

These machines will handle any size of envelope, wrapper, or label, and their utility for addressing work can readily be appreciated, but the use of the addressing machine is by no means confined to simply addressing envelopes and wrappers. It is not proposed to give a detailed description of the equipment and various capacities, as the illustrated booklets of manufacturers will demonstrate these very clearly. The machines, however, can be used for inserting the name and address on dividend notices, monthly statements, wage sheets, time-clock cards, insurance renewal notices, ground rent notices and receipts, etc.; and by the use of a special plate any part of the address plate which contains dividend instructions, codes, etc., can, if necessary, be eliminated from the printing. Another feature in the latest models is the automatic selecting device, by means of which the machine can be set to print only certain plates, *e.g.*, certain trades or classes. This feature will strongly appeal to the practical business man for it opens out a wide field of uses.

The advantages to be derived from the use of this class of machine for addressing are manifold. The ordinary electric model will print at the rate of 2,000 an hour, which is over twenty times the rate at which typists could do the work; further, it is obvious that the name and address must be printed just as it is on the plate or stencil which has previously been checked, hence errors and omissions can only arise through mis-operation of the machine. The work can be performed by an office boy or girl and does not require to be

attempted to introduce machinery for this branch of work. In a firm where the daily outgoing mail is very small no machines or appliances are necessary, and the little saving that could be effected from their use would not justify the capital expenditure. But in firms where a large amount of circular matter is issued or where the number of letters sent out is considerable, the introduction of folding, sealing, and stamping machines would be economical. There are, unfortunately, only a few machines available for this class of work, and even these are not so pre-eminently satisfactory as other classes of office machinery.

### FOLDING MACHINES.

When the mail to be despatched is tolerably large or the issue of circulars frequent, it will be found that the installation of a folding machine will effect a great economy. The folding by hand of large numbers of circulars or enclosures occupies much time, and there are one or two machines on the market which will save considerable labour and expedite the despatch of the mail. The Gammeier Multigraph Folder is specially manufactured for office use, and does not involve the initial expenditure and the installation of heavy machinery that is associated with the folding machine of the printing house. The machine is capable of making a large number of different folds, is electrically driven and automatically feeds, folds, counts, and stacks the circulars at the rate of 4,800 pieces an hour. The folding is, of course, superior to that done by hand, being precise; and further, very little attention is required during the operation.

In a large firm where the despatch of the letters is done by a despatching department, it could be used for the folding of the single-sheet letters which are typed on a uniform size paper, and would be specially suitable for folding correspondence to be placed into window envelopes.

By the adoption of a size of notepaper that will fold exactly to suit the opening of a window envelope, and the issue of instructions to all the typists to write the name and address

of every letter exactly on a certain part of the sheet or within printed marks provided for the purpose, a considerable economy could be effected in the despatch of the evening mail if the single page letters were passed through a folding machine.

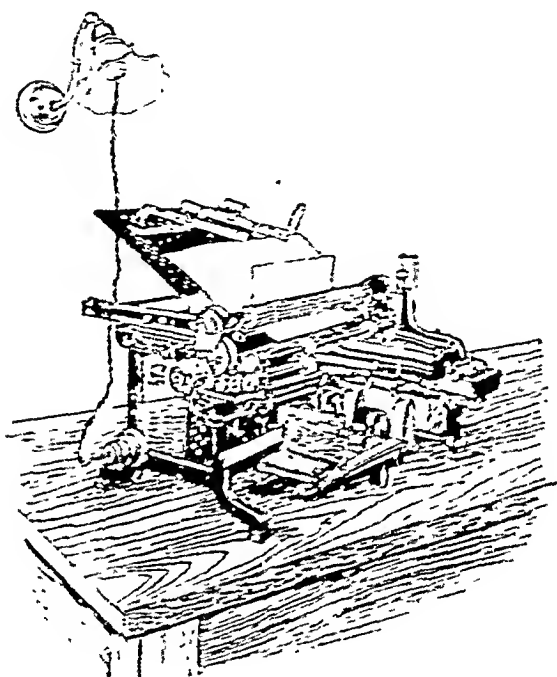


FIG 20

GAMMETER MULTIGRAPH FOLDER



## STAMP AFFIXING MACHINES.

When a large number of circular letters is mailed it is usual to obviate the necessity for affixing stamps by prepaying the postage money. When the number is large this special service of the Post Office saves much time, and the only objection to the practice is that the "prepaid stamp" indicates to the recipient that the letter contains circular matter. The service cannot be used unless the letters are chargeable with a uniform rate of postage, so it is not usual for a commercial house to prepay its ordinary mail, hence its use is practically confined to circular matter. The affixing of postage stamps by the usual office methods is rather slow and messy, and the necessary records in the postage books occupy some time.

Stamp affixing machines are now available that will efficiently affix stamps of any value. A recorder counts every stamp and the machine can be locked so that the stamps can neither be affixed nor removed. Apart from the fact that these machines constitute a real labour-saving device they enable the work to be performed more hygienically and prevent the possibility of pilfering. The pilfering of postage stamps is a matter of greater importance than is generally conceded, and the introduction into an organization of a system that eliminates the possibility of the temptation to use the stamps is also a safeguard. The use of a postage record book is then unnecessary, or, if kept at all, only very short consolidated entries are required. Several firms, however, still retain the stamp record for purposes of reference and as a double check. The stamps for these machines are obtained from the Post Office in rolls of 500.

Another use to which these machines can be put is to advertise by stamps, e.g., to affix small advertising stamps of coming events or new features on all correspondence. Dummy rolls of stamps on which any printed matter is inserted can be supplied by Messrs. Allchin, Ltd., 28 England Lane, Hampstead, London, N.W.3

## INSURANCE STAMP AFFIXERS AND CANCELLERS.

These machines are practically the same as the postal model with the additional feature that the insurance stamp is cancelled by dating across the centre. The use of such a

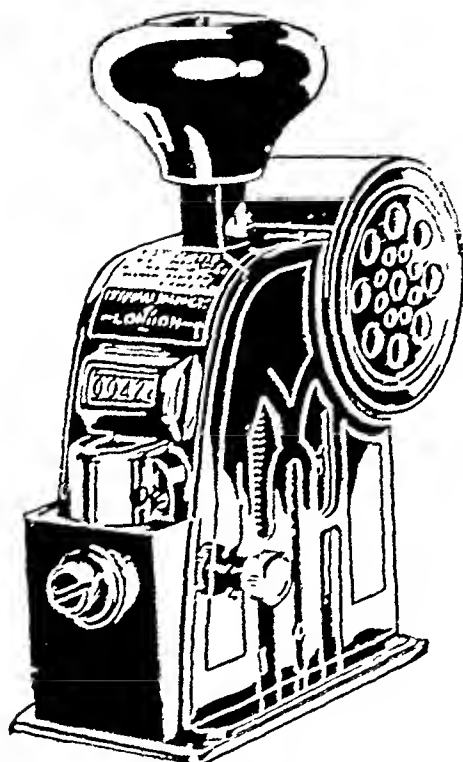


FIG. 21

MULTIPOST STAMP AFFIXER

workmanship. The NATIONAL and the STANDARD Stamp Affixers are other machines available.

The greatest value to be derived from the use of these machines will be obtained by centralizing the despatch departments or the insurance card stamping, and it has been found in one firm that the services of twenty people for two hours every day in sticking stamps by the usual method could be dispensed with, and two clerks were able to do the whole work in less time with a machine.

#### STAMP AFFIXERS.

MULTIPOST. Merkham Trading Co., Ltd., 329 High Holborn, London, W.C.1.

NATIONAL. Edison Swan Electric Co., Ltd., 123 Queen Victoria Street, London, E.C.4.

STANDARD. Roberts Numbering Machine Co., 63 Chancery Lane, London, W.C.2.

#### ENVELOPE SEALING MACHINES.

Every despatch clerk is cognisant of the time involved in sealing large numbers of envelopes, and although the quickest hand methods may be employed, it is a process on which considerable time is expended. The sealing of one or two letters will probably always be done by licking the flap, but apart from the harmful effect it is much too slow for business if large numbers have to be dealt with. The usual office method of laying the envelopes out flat one over the other, with the gummed edges exposed, and damping the gum and turning the flaps over one by one is undoubtedly very effective, and if the letters are of varying sizes or rather bulky is probably still the best method. But in the case of the despatch of a large mail, especially circular mail, where all the envelopes are of one size, the use of a sealing machine is very economical. Several envelope sealing machines are on the market, but care should be exercised in selecting one, for some are liable to fail to perform what is claimed for them, at least for any length of time.

Fig. 22 (page 56) is a photograph of the STANDARD Sealing Machine. A glance at the working of the machine will show that it would not be practicable to insert varying sized

envelopes into the hopper, although the machine can be adjusted to take various sizes, one size at a time.

### ENVELOPE SEALERS AND STAMPERS.

A combination envelope sealer and stamping machine has recently been patented and it is hoped will be placed on the market shortly.

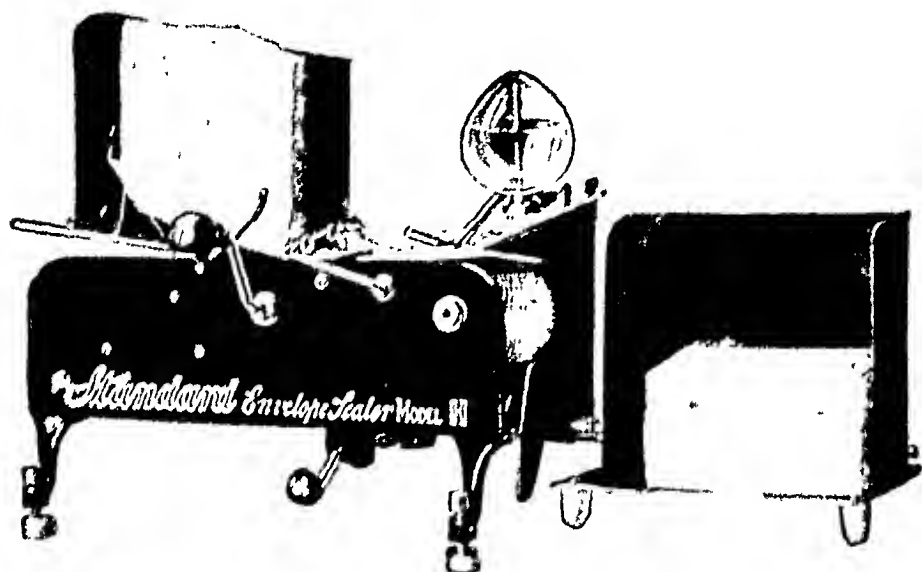


FIG. 22

ENVELOPE SEALER

### ENVELOPE FILLING AND SEALING MACHINE.

A machine that will fill enclosures into envelopes has long been a desideratum. A machine which can handle two enclosures, insert them into the envelope, and seal in one operation has recently been introduced. An average speed of 4,000 an hour is claimed. The machine has not (at the time of writing) been used in England.

The MULTIFILLER automatically feeds envelopes from the bottom of a magazine on the right of the machine, while the enclosures are fed in synchronism from the left. They are then collated in the middle and the enclosures are filled into

the envelope. After filling, the envelope, which may be of any reasonable size, is sealed, the opening of the flap and the moistening having been performed while the enclosures were being collated. If there are more than two enclosures, the envelopes may be fed through several times, and finally sealed when the last enclosures have been inserted.

#### ENVELOPE SEALERS.

ACORN THEXTON. Acorn Brass Co., Chicago, U.S.A.

GRAYWOOD. The Merkham Trading Co., Ltd., 329 High Holborn, London, W.C.1.

MAIL-o-METER (Sealing and Stamping). Mail-o-Meter Sales Co., Chicago, U.S.A.

MARKOE. International Multigraph Co., Ltd., 15-16 Holborn Viaduct, London, E.C.1.

REYNOLDS. Reynolds Envelope Sealer Co., Chicago, U.S.A.

SEALOGRAPH. Sealograph Co., Kansas City, Missouri, U.S.A.

STANDARD. The Mechanical Office Equipment Co., 15 Dartmouth Street, London, S.W.1.

#### ENVELOPE FILLING AND SEALING MACHINE.

Multi-Insert Mailing Machines Corporation, Tribune Building, New York.

As an example of a complete installation of office machinery, the following description of the procedure adopted by a railway company in the preparation and despatch of about 20,000 dividend warrants may be given—

1. The name and address is printed on the top part of the warrant (the counterfoil), and on the lower part (the cheque) by an addressing machine.
2. A clerk enters on the warrant the amount of stock held, together with the net amount of dividend which is taken from tables previously prepared on a calculating machine.
3. These entries are summarized on an adding machine, and the totals of each class of stock checked.
4. The cheque is written in by means of a cheque writing machine.
5. The warrants, having been checked in the accountant's office, are folded on a folding machine.
6. The warrants are placed by hand into window envelopes.
7. The envelopes are sealed by a sealing machine.
8. Postage stamps are affixed by the Multipost Machine.

This is a very brief summary of the principal stages of the work, several further minor operations being introduced in order to secure accuracy of work and correct summarization, with the result that the tedious business of issuing dividend warrants is expedited, the possibility of error reduced to a minimum, and the work is more efficiently performed.

## DESPATCHING OF PARCELS AND CASES.

Machines are also available for use in the despatch of parcels and cases. In the case of regular customers, if the

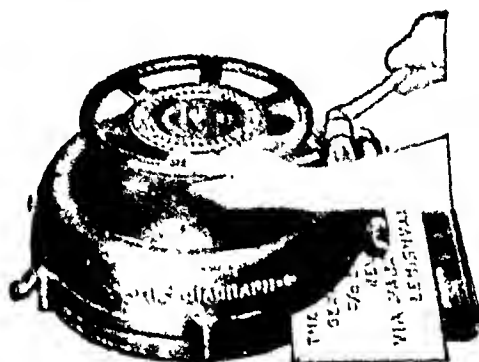


FIG. 23  
DIAGRAM

parcels are small the gummed label, railway tab, or wrapper can be printed on an addressing machine. If larger print is required, large label type, the letters of which are about  $\frac{1}{2}$  in. high, can be embossed upon the address plates. The labels can be stapled on to the cases, etc., by a Hotchkiss case stapling or similar machine. The writing of labels by hand is generally very slow, and the best engrossing is inferior to the bold block letters of the machine.

## STENCILLING PACKAGES, Etc.

For marking cases, crates, kegs, drums, casks, bales, and large parcels the use of labels and tags is not recommended. For this purpose a Stencil Cutting Machine, such as the

DIAGRAPH, is very efficient. The machines are made in various sizes, cutting letters from  $\frac{1}{2}$ " to 2" in height. A stencil is made similar to the copper, brass, or zinc stencil by punching out the letters from a flexible oilboard in a hand machine about the size of a typewriter; the smallest size machine will cut six-line stencils on any length of oilboard  $6\frac{1}{2}$ " deep; the

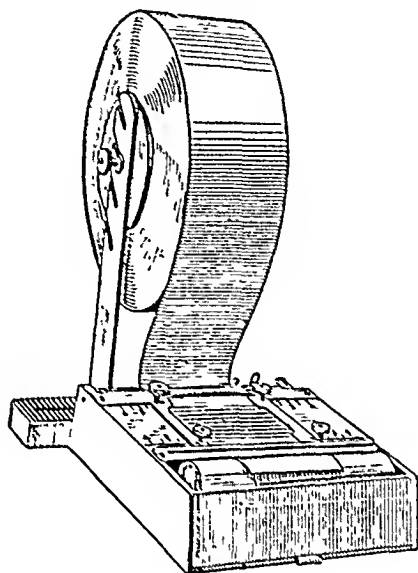


FIG. 24

## GUMMED TAPE SEALING MACHINE

cutting of the names and addresses can be performed by a junior almost as quickly as on the typewriter. The employment of this class of stencil has many advantages over the use of metal stencils, for the alignment is always perfect, curved surfaces present no difficulty, and the stencils can be filed away and used again when required.

## GUMMED TAPE MACHINES.

In the tying up of small parcels the use of string can often be entirely dispensed with by using a gummed tape sealing machine. A reel of stout gummed paper of any width or colour

## CHAPTER VI

### DUPLICATING MACHINES AND PROCESSES

General Remarks—Duplicating v. Printing—Rotary Stencil Duplicators—Type-setting Duplicators—Flat Duplicators—Composition Processes—Photo-copying Processes.

VARIOUS processes and many machines have been invented for the rapid and economical reproduction of circulars and documents, and some form of apparatus for the purpose is found in almost every office. But the words "duplicating machines" will be likely unfavourably to impress the responsible heads of clerical establishments, because the quality of the work turned out on this class of machine is usually very defective, and after a short interval the process is generally abandoned except for matters of unimportance or of extreme urgency.

In the first place it is therefore proposed to show in what respects the more general use of the process should be extended, for although these machines have been so widely adopted, the real scope and uses of the rotary duplicating machine in expert hands have not been generally appreciated. At the outset it is confidently asserted that any imperfections in the work are invariably due to the failure of the operator to observe the instructions for the proper care and use of the machine, and to exercise an ordinary amount of initiative and ingenuity.

Every labour-saving device in the office meets with a certain amount of antagonism, but perhaps this class of machine meets with most in a small office on account of the usually rather messy and inky character of the work. If, however, the machine is properly cared for, the amount of inconvenience occasioned by the ink is very trifling, and no employee who considered the advantages which the process affords to the business would display any real opposition.



## · DUPLICATING SAVES MONEY.

The duplicating machine, however, is not so much a labour-saving device as a means of cutting down printers' bills, and, in addition, affording facilities and promptitude of delivery which no printer could give. In many respects duplicating is more advantageous than printing, and, except where very large quantities are required or the matter is of a very complex nature, the economy as compared with printing is very great. The monetary saving varies with the nature of the work, and on the average is at least three-fourths; while in some cases, duplicating costs only one-twentieth the price of printing. It is very difficult to postulate in exact terms the economy and advantages of duplicating, but for all quantities ranging from 20 to 2,000 copies of jobs which are within the scope of duplicating processes, the magnitude of the economy is very great, while the advantages are very numerous. The chief advantage is the saving of time, for a circular letter or instruction can be duplicated in a few minutes and immediately despatched; and copies of long documents can be produced in a few hours, in both cases in less time than the proofs could be obtained from the printer or even before the copy could have reached him. Another indirect saving, and one that, though considerable, is often lost sight of, is that the office work in connection with the ordering and paying for printing is eliminated. A further consideration is that for many documents, duplicating is the most suitable method of reproduction. An ordinary printed circular letter loses much of its personal character and receives less attention than an apparently specially typed letter. If a duplicated circular is well executed with a facsimile signature in a different coloured ink, it is almost indistinguishable from a separately typed and signed letter, and would, therefore, be more effective than if it were printed. Another consideration which may weigh very heavily in certain classes of work is that, by duplicating, the risk of disclosure of confidential data is eliminated or, rather, confined to the firm's own operators,

and it is also desirable sometimes that the "copy" should not be removed from the office.

## DUPLICATING v. PRINTING.

The great advantages to be derived from the use of office duplicating machines are tolerably well established, but the experience of many business firms is that the process, whilst affording admirable facilities for rush work in connection with the issue of prices, instructions to staff, etc., is so limited in its scope as to justify printing for all other work. Although this view is generally held and is justified by the bad quality of the work usually turned out, it is contrary to the experience of the writer and of firms where the duplicating staff is supervised by someone possessing initiative and organizing ability; the character of the work which under the best conditions can be produced on these machines compares very favourably with printing. By establishing a duplicating section one well-known office is able to produce expeditiously on the premises large quantities of documents which were formerly printed at a cost four times as great. Further, the ordinary correspondence work of the office has been facilitated by the provision of thousands of duplicated "skeleton" letters which the typists "match in," as occasion requires with a great saving of money, time, and labour. In a large undertaking, especially a concern with a number of branches, there must frequently arise a need for the circulation of memoranda of instructions, etc., and if these can be multiplied at the head office and despatched without delay, the whole concern is able to work always on uniform lines.

In most business houses the duplicating machine is more or less a neglected piece of machinery in which no one takes much interest, and which the typists and junior clerk use as little and as inefficiently as possible. If a genuine effort is made to develop and extend the application of the process in every possible way, new uses for the machine will be discovered every day, and the firm will have facilities for the

reproduction of documents which they never contemplated could be afforded by the duplicator.

### TYPES OF DUPLICATORS.

The types of duplicating machines or appliances available for office use fall under four heads, viz.—

(a) “Stencil” machines, both rotary and flat, in which the copy is produced by printing through the perforations made on a waxed sheet, or photographically on a gelatine sheet;

(b) Printing type machines, which are really convenient adaptations to office use of the ordinary printing press;

(c) The Photostat and other photo copying machines by means of which copies are reproduced by photographic processes; and

(d) Composition duplicators in which the copy is printed from an aniline ink negative sustained upon a gelatine or china clay composition.

The machines on the market in each of the above classes differ in many respects, and their capabilities vary so considerably, that it is necessary to carefully consider the intended general purpose before selecting any particular type.

### ROTARY STENCIL DUPLICATORS.

The number of copies obtainable from one stencil varies, but if a glazed paper is used, 3,000 or more copies of an average quarto circular can be obtained ; with an absorbent or other rough surfaced paper the average number of good copies would be about 2,000 ; with the Durotype or similar stencil as many as 6,000 copies can be secured. Two hundred and fifty copies of a document of about sixteen lines of typing can be typed and multiplied under half an hour. Among the various purposes for which the machine can be used may be mentioned book and pamphlet work, printing cards for card indexes, skeleton letters, graphs, sketches, diagrams, tables, reports, etc. With regard to reports, minutes of evidence and documents which are prepared in book form, it is possible to produce, say, 200 copies of a sixty-page book at a cost of one-eighth to one-quarter of what a printer would charge, and if the arrangement of the matter is carefully planned the result should be as readable and pleasing to the eye.

## WORKING COSTS.

The working costs of the duplicator are certainly heavier than most classes of office machinery, because it is a producing machine, and must be fed with raw material in the shape of paper and ink. But exact records kept of the cost of supplies, labour, and establishment charges in connection with duplicating work show that, even after allowing for a fair amount of waste, the total expense is, on the average, about only one-fourth of the cost of printing, and is much less than the charges made by copying offices. Many firms, however, fail to effect this rate of saving, the reason almost invariably being that the amount of waste is often ten times what it should be, and that the work is not carried out with the same supervision and attention to details that it would receive if it were a manufacturing process carried on by the firm. In the factory the manager and foreman study every separate stage of production, and the most meticulous care is taken to save fractions of seconds of time and to eliminate waste or to utilize all waste material. The

work is closely supervised, and a fair average output is obtained from each workman, and in many cases faulty work and waste has to be made good by the workmen. If this principle is applied to duplicating the quality of the work will soon improve, and the waste will be reduced to the lowest possible margin. A certain amount of waste is unavoidable, and is

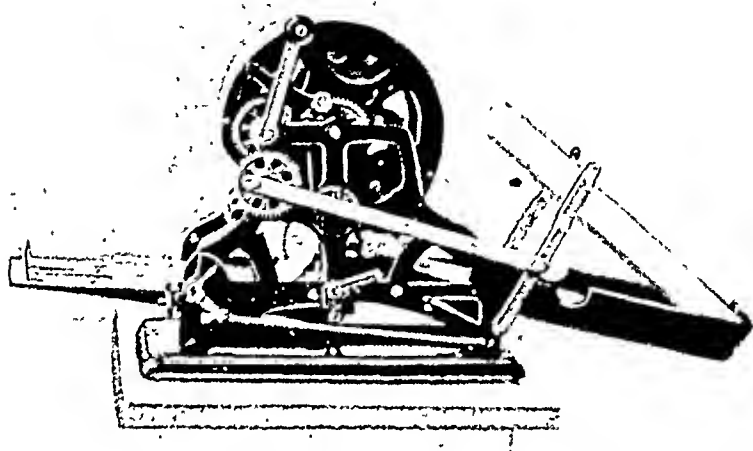


FIG. 25

#### RONEO, WITH AUTOMATIC INTERLEAVING ATTACHMENT

greater than the operator needs for test copies, but this waste can be utilized by issuing it out as slips for office memoranda.

#### THE RONEO.

The operation of the Roneo consists of making a stencil on a waxed sheet by means of an ordinary typewriter, and stretching the stencil over an inked drum; by automatically feeding the paper between the drum and an impression roller, the copies are produced. The Roneo uses an ink having water and glycerine as its basis. This feature has long been claimed to be a great advantage in that it dries rapidly and without a "halo" of oil round the letters, and that it can be

used on hard glazed papers. But owing to the improvements that have been made in the manufacture of oil inks for duplicators, the previous disadvantages of the use of oil inks no longer exist. It must be said, however, that the use of the "water" ink gives results which more nearly approximate to actual typewriting, while the use of an oil ink gives a clearer, sharper, and more definite impression.

# THE ELLAMS.

Ellams Rotary Duplicator is in appearance very similar to the Roneo, but the paper feed and inking devices differ con-

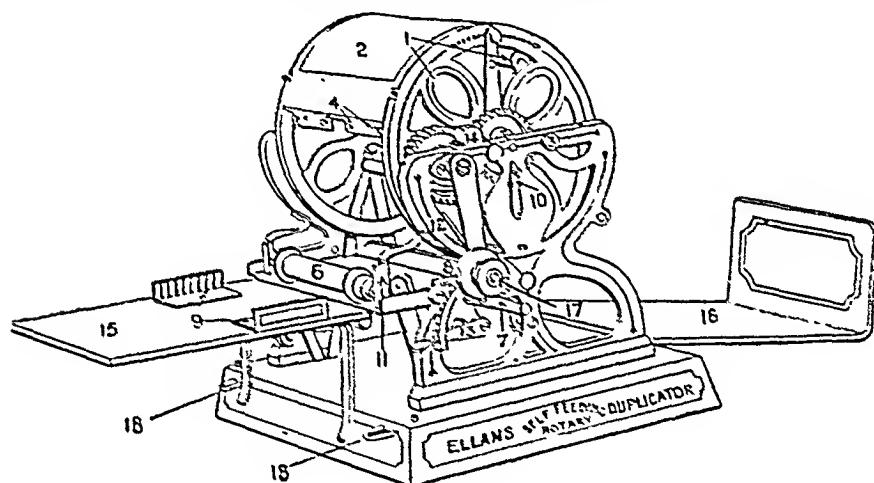


FIG. 26

ELLAMS

siderably ; however, the capabilities of both are very similar. An oil ink of special consistency that does not give a halo round the letters is used on Ellams rotary.

# THE GESTETNER.

Mr. D. Gestetner is the pioneer of the stencil principle of duplicating, and all the present-day machines undoubtedly owe much to his ingenuity and assiduity in perfecting stencil methods and supplies. It will be observed that the Gestetner Rotary Cyclostyle is quite different from the Roneo type of

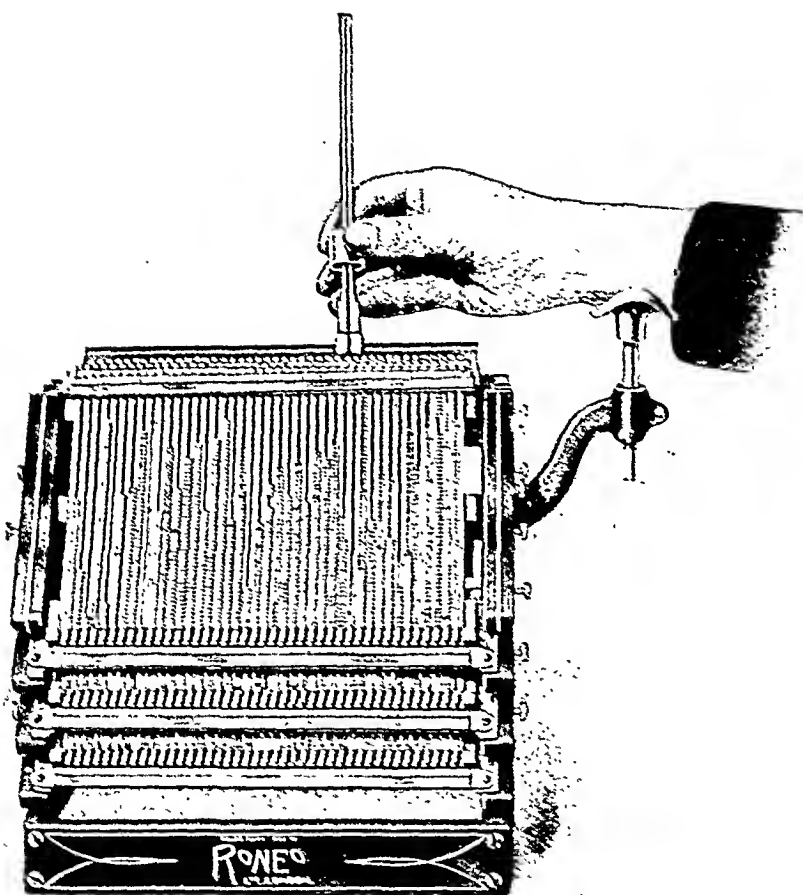


FIG. 28  
RONEOTYPE DISTRIBUTING FOUNT

times heavier. The setting-up process of the type-setting duplicator is naturally slow compared with typing a stencil and, moreover, the type has to be re-distributed, but it compares very favourably with the printer's press, and the object of the machine is, of course, to do much of the work which would be sent to the printer. In a large office where the amount of work to be duplicated is very considerable and

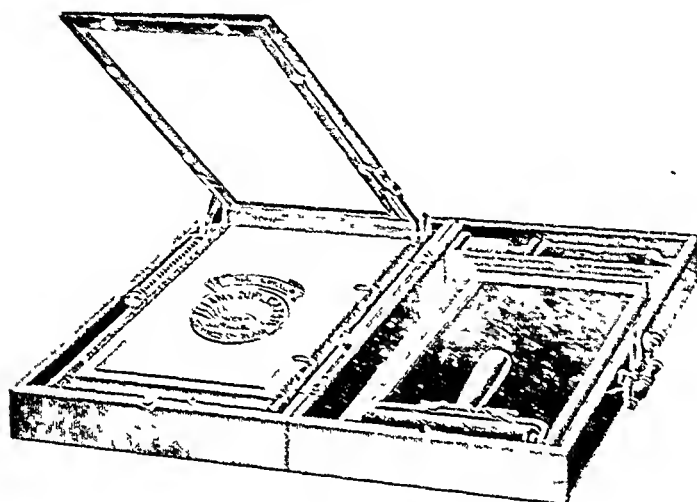


FIG. 30  
WILLIAMS FLAT DUPLICATOR

where large numbers are frequently required, the additional initial expense of a type-setting duplicator, as compared with a stencil duplicator, can soon be justified. The reproduction of work on glazed paper, and the use of electrotypes for letter headings and signatures, enables an office to turn out really high class work and in some respects superior to that of a printer, for, as the body of the letter is printed by means of a ribbon similar to that of a typewriter, each circular has the appearance of having been specially typed. Many firms, however, have not sufficient work to justify the expense of a type-setting machine, and even where the amount of work is considerable, the stencil machine is still more economical and convenient for small numbers of copies.



In the Gammeter the type is set semi-automatically and no characters are handled. In the printing machine there is a device for securing perfect registration, which is essential for work in two or more colours.

### THE FLAT DUPLICATOR.

The flat duplicator has probably been used more extensively than any other form of apparatus, but this process is now giving place to the rotary. Nevertheless, excellent work can be done with a flat duplicator, and slowness of operation is its only drawback. Moreover, there are numbers of concerns where there is not sufficient work to justify the expense of a larger machine. The stencil for the flat duplicator is cut similarly to that for the rotary, but instead of being placed on a rotary drum it is stretched in a frame. The ELLANS, MIMEOGRAPH, and the NEO-CYCLOSTYLE are familiar, and a recent machine called the SWIFTOGRAPH, is probably the nearest adaptation of the rotary to a flat apparatus.

### COMPOSITION PROCESSES.

Most people are familiar with the Hektograph jelly or gelatine process, as it is undoubtedly the simplest process known. The introduction of the stencil process, has, however, caused this process to be despised, but even at the present day where the number of copies required is very small, for certain classes of work required to be printed in a variety of colours, or where the expense of the larger machines cannot be justified, this process is quite satisfactory. The composition varies with different makes, and the old jelly, or gelatine, is giving way to the china clay composition, the most popular of the clay duplicators being the PLEX, and the GRAPHOLITHIC. The process consists in writing, typing, or drawing with a special ink and placing the copy face downwards on the composition on which a negative is formed; the copies (not exceeding about sixty with handwriting or thirty with typewriting from one original) are then obtained from the negative until the ink is exhausted.

There is also another form of duplicator in which the original is placed on a part of a roll of paper on which there is a film composition, instead of on a tray of composition. This obviates the necessity of washing off, for the ink sinks



FIG. 31  
TABLOGRAPH

in and the film covered paper may be used two or three times. The TABLOGRAPH is an excellent example of this kind of duplicator.

## PHOTO COPYING PROCESS.

The great and increasing demand for the rapid production of copies of tracings, drawings, contracts and other documents has led to great improvements both in the nature of the photo-copying process employed and in the apparatus used for working the process; and during the war British enterprise had to develop these processes which were formerly dependent on German products.

The various processes which are now employed each have special advantages and limitations, and it is not proposed to show where one process is more advantageous or economical, or at what point it should give way to another. Space will not allow such comparisons to be made, but any

practically no photographic knowledge is necessary to work it, and copies can be enlarged (within certain limits) or reduced as desired. The sensitized paper is mechanically developed and fixed inside the camera, and the copy which is

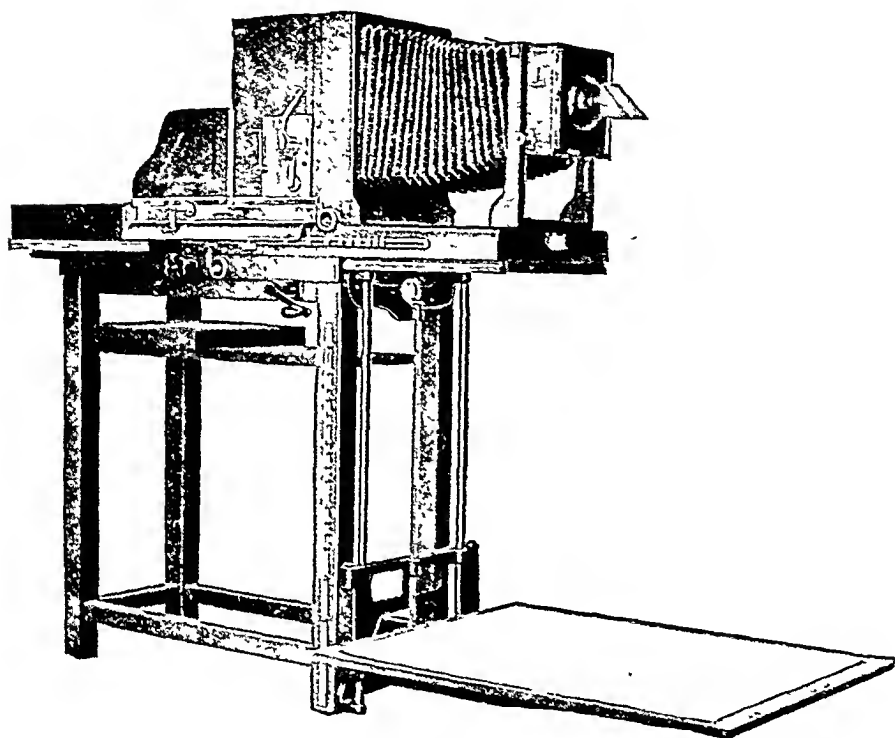


FIG. 32  
PHOTOSTAT

produced in about half a minute then requires only to be subsequently washed. There is, of course, no necessity for a dark room, but where the Photostat is employed on a large scale the developments are generally made outside the machine.

By the adoption of the Photostat system of copying drawings, tracing is to a certain extent superseded, as the apparatus will copy direct from the pencil drawing. It can be used for copying blue prints, tabulated lists of figures,

It is not possible here to exhaust the list of various uses to which these machines can be applied, for in each system there is great flexibility in the method of automatic time keeping and job costing. In most systems there is an automatic two-colour device that prints late comers or early quitters in red

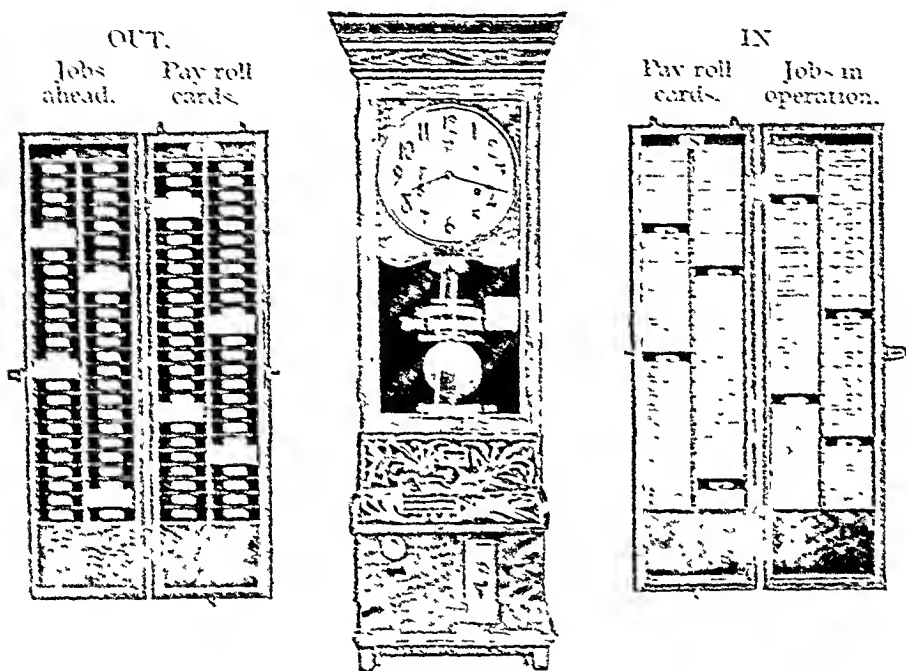


FIG. 33  
INTERNATIONAL

ink, and the handling of the results is thereby considerably facilitated. Time recorders may be divided into four classes: (a) time recording by card, key, dial, and autograph; (b) job costing by cards; (c) time stamping; and (d) machines which will serve two or more of these purposes.

The photograph above shows an International Machine which serves as an automatic card time recorder and for job costing.

This machine, and the racks, should be placed near the foreman's desk, which may be at the door or in the centre of

# DAILY COST CARD

No. 21. DATE 31/1/20.

Form No 6977

NAME James Kinton.

JOB No.	Time		Clock Time Record
411.	OFF	1. 11.	o 9 11
	ON		o 8 00
328.	OFF	1. 19.	o 10 34
	ON		o 9 15
1098.	OFF	1. 25.	o 12 01
	ON		o 10 36
756 <sup>2</sup>	OFF	2-23.	o 3 21
	ON		o 12 58
438.	OFF	. 25.	o 3 53
	ON		o 3 28
521.	OFF	1. 32.	o 5 31
	ON		o 3 59
	OFF		
	ON		
	OFF		
	ON		
	OFF		
	ON		

International System

FIG. 34

INTERNATIONAL UNLIMITED CARD

In other concerns, business organizers have found that the office staff lose 100 minutes a week per head.

Although time recorders have been introduced primarily for use in the factory, they can with great advantage often

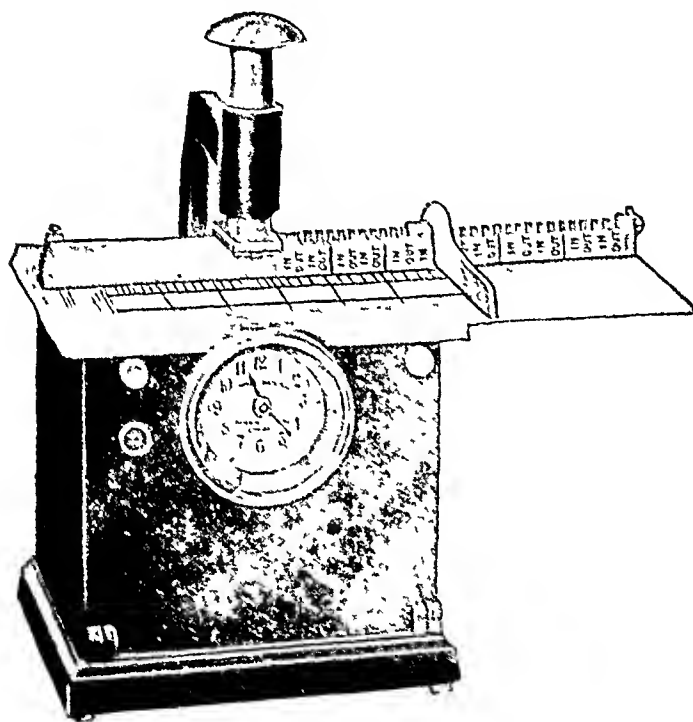


FIG. 36  
BLICK UNIVERSAL

be employed for making time records of office work—especially the autograph type of recorder. Another type of machine can be used in a small office as a time recorder for the clerks, and as a time stamping machine for correspondence, etc.

The above photograph of a "Blick Universal" time recorder is suitable for a small factory or office, or for departmental work in a larger concern, and can be used as a time recorder, job coster, and correspondence time stamp.

In addition to the time and date the machine will print

the name and address (if necessary) of the firm together with initial words, such as "Received," "Answered," "Registered," etc.

The *Autograph Time Recorder*, which is made by all the firms, is pre-eminently suitable for office staffs, etc. In this machine the employee signs his name on a strip of paper which is exposed in the slot, and the exact time of arrival or departure is automatically printed against the signature.

In nearly all modern card record systems there is no limit to the number of registrations that can be made on the machine; but it would be inadvisable to use one machine for too many workers, as a considerable congestion and loss of time would be involved in "clocking" in or out.

#### TIME RECORDERS

**BLICK** Blick Time Recording Devices, 174 Gray's Inn Road, London, W C 1

**GLEDHILL-BROOK** Gledhill-Brook, 26 Victoria Street, London, S.W 1.

**INTERNATIONAL** (including BUNDY, DEY and ROCHESTER RECORDERS)

International Time Recording Co., 57 City Road, London, E C 1.

**NATIONAL** The National Time Recorder Co., Ltd., 5 Blackfriars Road, London, S E 1

**PREMIER** Premier Time Recording Co., Ltd., Southampton House, 317 High Holborn, London, W C 1

**RUSMOID & KOSMOID.** Rusmoid Ltd., 15 Dartmouth Street, London, S W.1.

#### TIME STAMPS

**BLICK** Blick Time Recording Devices, 174 Gray's Inn Road, London, W C 1

**C T L** Frank Pitchford & Co., 11A Well Street, Jewin Street, London, E C 1

**ECONOMO, ELLIS, ECLIPSE, ENPIRL, ETC** J. M. Lindner, 17 Fairingdon Avenue, London, E C 4

**RUSMOID & KOSMOID** Rusmoid, Ltd., 15 Dartmouth Street, London, S W 1

**STANDARD.** International Time Recording Co., 57 City Road, London E C 1.

## CHAPTER VIII

### CHEQUE WRITERS

General Remarks—The Protectograph—The Safeguard—The Elliott-Fisher Pin Point.

THE number of cheque frauds that take place is far greater than is generally supposed, for only in a limited number of cases is it possible to take proceedings and bring a report of the case to the notice of the public. Further, it is unnecessary to point out that cheque frauds are generally carried out by highly skilled criminals, and in spite of the specially surfaced paper on which cheques are printed, and the fact that the cheque form is often printed in an ink that is more easily bleached or removed than ordinary writing ink, it is possible for an expert to remove "crossings" and line over any part of the cheque that may have been destroyed, and to alter the amount. Again, the falsification of a cheque in many cases does not require the technical skill of a professional forger. Owing to the laxity with which many firms and people make out cheques, it is often possible to increase the value of the cheque by the addition of a letter and a figure. Thus, a cheque for eight pounds only requires the addition of a "y" and of a figure "0," and the sum is eighty pounds. The bank would certainly honour such a cheque, providing the alteration was not too apparent. The ingenuity and skill which is shown in forging cheques baffles all but the most careful methods of writing out a cheque. In a case in the High Court the judge pointed out that the public should so draw cheques as not to expose bankers to risk through subsequent alterations. To make an ordinary hand-written cheque absolutely tamper-proof is not easily accomplished, but by the use of a cheque writing machine the risk of fraud is not only reduced to the minimum but entirely eliminated.

There are several cheque writing machines available—the



PROTECTOGRAPH, the ELLIOTT-FISHER, and the SAFE-GUARD. The Protectograph cheque writer prints in two colours the amount for which a cheque is drawn. It writes a complete

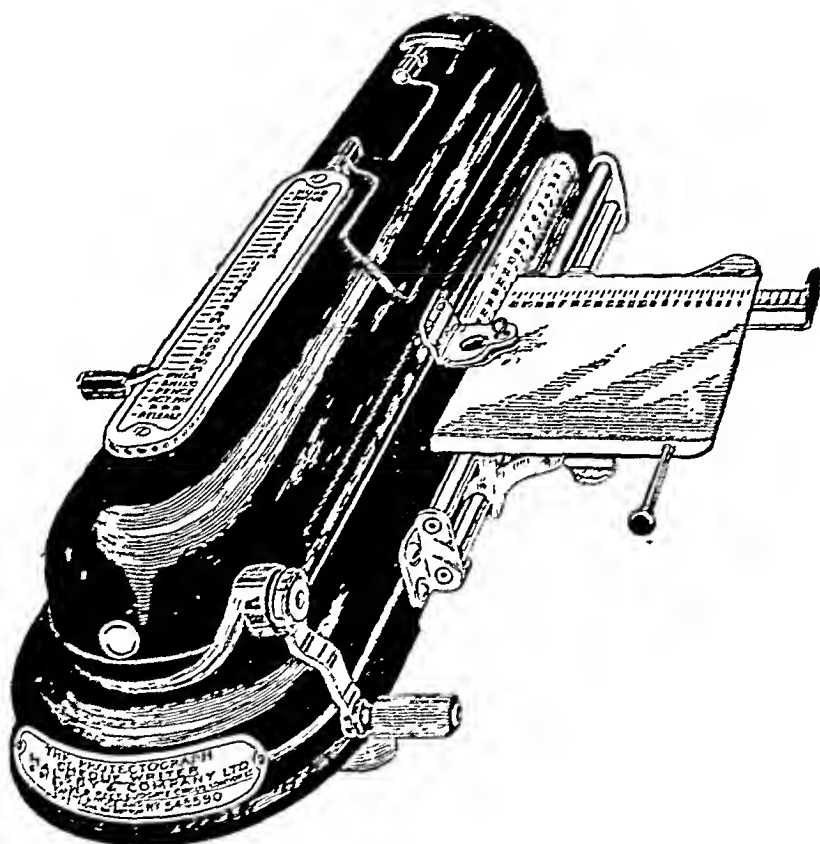


FIG. 37

## PROTECTOGRAPH CHEQUE WRITER

word at each turn of the handle and the operation is undoubtedly faster than writing.

The salient feature of the machine is, however, that it crushes or shreds the words and thereby forces the indelible ink into the fibres of the paper, thus rendering subsequent falsification by mechanical or chemical means impossible. The amounts are written in red and the denominations (pounds, shillings, pence) in black, and any amount from a

penny to a million pounds can be written. The operation of the machine is very simple, and with a little practice cheques can be made out more quickly than by hand-writing. This method gives uniformity and neatness to all cheques, and ensures that they are protected before final signature. This

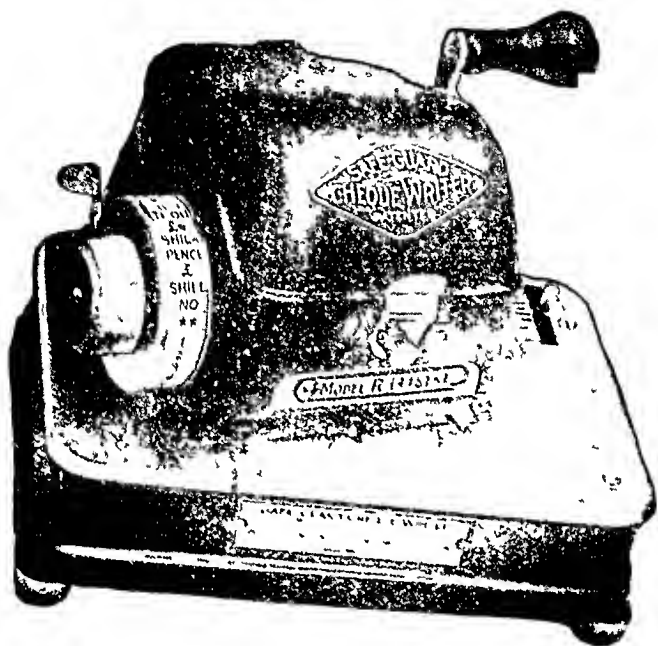


FIG. 38  
SAFE-GUARD CHEQUE WRITER

machine will also crush a "not negotiable" or "Account Payee only" crossing, and it will take any size cheque.

In the Elliott-Fisher the protection is secured by the use of a "Pin-point Type," which makes a printed and perforated impression on the cheque, and writes the whole of the cheque except the signature. By arranging the cheques in books with four to a page and inserting the counterfoils behind each page of cheques, a facsimile of every cheque made out is obtained and the totals are collected and can be posted to the cash book. The cheque book itself is placed into the

machine so that the counterfoils remain bound in the book, and this book will form an itemized subsidiary cash book.

In the Safe-Guard Cheque writer the payee's name as well as the amount is protected by shredding or perforating the name after it has been written in ink. It is, of course, highly desirable to protect the payee's name, otherwise it can be eradicated together with the crossing and the words "Cash" or "Bearer" substituted. The Safe-Guard writes and shreds the words diagonally—each word commencing under the previous word which allows very large amounts to be written on one line.

#### CHEQUE WRITERS.

ELLIOTT-FISHER PIN POINT Elliott-Fisher Co., 10 Queen Street, London, E C 4

PROTECTOGRAPH Halsby & Co., Ltd., 6 St. Bride Street, London, E C 4

SAFE-GUARD. Lanston Monotype Corporation Ltd., 43 & 43A Fetter Lane, London, E C 4.

## CHAPTER IX

### MISCELLANEOUS MACHINES

Letter Openers - Stapling and Wire Stitching Machines—Pencil Sharpeners—Coin Counters and Sorters—Numbering and Dating Machines

#### LETTER OPENERS.

THE opening of the letters has long been found to occupy considerable time especially when the mail is large, and the "slitting" process is rather slow. Mechanical devices have been introduced for opening the mail, but owing to the various sizes and bulk of letters it is naturally rather a difficult matter to devise any machine which can deal with all classes of matter.

Machines falling within this class are therefore not eminently satisfactory, and it is doubtful whether a perfect mechanical device can be introduced for this purpose. Some of the present machines are undoubtedly exceedingly useful for rapidly dealing with large numbers of letters, especially when they are of a tolerably uniform size, but all machines have a tendency to mutilate enclosures, and firms receiving postal orders or any important enclosures which now render it expedient to slit three sides of the envelope, will probably find it quicker to slit by hand than to feed through the machine three times.

The machines are of very simple construction and very easy to operate. A bundle of envelopes is placed on to the feeding table and the turning of the crank or the electric drive sets the feeding belt in motion, which takes the letters from the bottom of the pile and conveys them, one at a time, through the machine in contact with rapidly revolving circular knives which take a fine shaving off one edge of the envelope. This shaving is certainly very fine and, generally speaking, ensures against any damage to the contents.

It is noteworthy that in America large numbers of business concerns use these machines.

#### LETTER OPENERS.

THE BIRCHER LIGHTNING. Merkhams Trading Co., Ltd., 329 High Holborn, London, W.C.1.

THE O.K. O.K. Manufacturing Co., Syracuse, New York.

#### STAPLING MACHINES.

The number of papers required to be fastened together varies in different offices as also does the method of fastening.

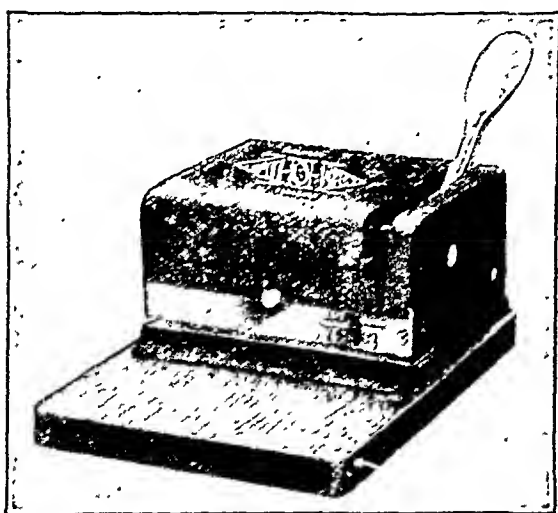


FIG. 39  
SPOOL O' WIRE

In offices where large quantities of papers are attached, the use of a stapling machine will save considerable time and give a neater form of fastening. Many types of machines are available, the Hotchkiss being the most popular. But for large numbers a machine not requiring to be fed with ready-made staples is preferable, and the EVEREADY, the SPOOL O' WIRE, the BRITISH WIRE STITCHING MACHINE, or any machine supplied by printers' engineers, making its own staples from a reel of wire should be used. The Spool o' Wire or Eveready

machines are quite cheap and suitable for office work. There is an exceptional economy in the use of staples in these machines, and in the Spool o' Wire a roll of wire makes 15,000 staples, which works out at about 125 for a penny, while in

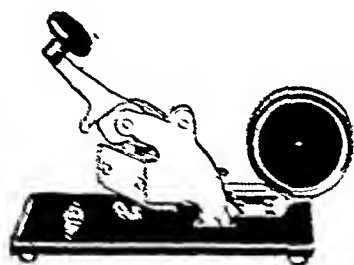


FIG. 40  
EVEREADY

the Eveready, which is the cheaper machine, the cost of the staples works out at 105 for a penny.

#### STAPLING MACHINES

(b) Coin Counters. The International Coin Counter consists of a horizontal rotating disc in which are holes made of

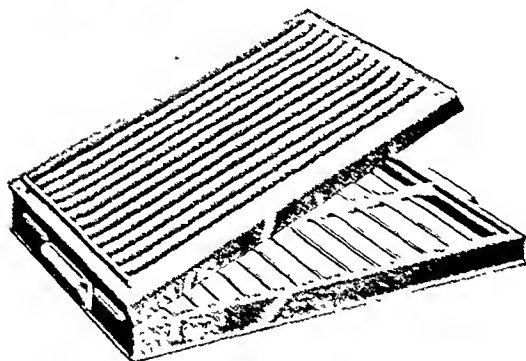
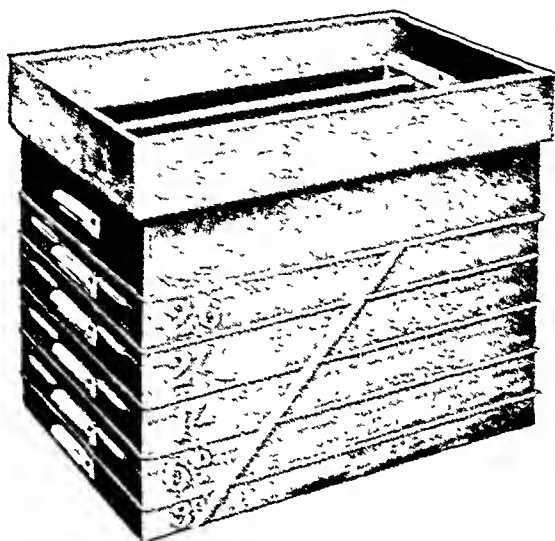


FIG. 42

AUTOMATIC SILVER SORTER

coins have passed, the machine automatically stops and the coins are packeted. The machines are made in hand and power models.

The Burdick Coin Counter is made in hand and power operated models, and counts and totalizes silver coins of all



Style A  
**314752**

Style H  
**123456**

Style G  
**12345**

Style E  
**2745**

Style D  
**123456**

Style K  
**1234567**

FIG. 43

#### ROBERTS NUMBERING MACHINE

denominations either mixed together or in separate denominations. These machines are useful in banks and large firms, as counting by hand not only is slow and involves much drudgery but requires to be checked in order to ensure accuracy.

#### COIN COUNTERS AND SORTERS.

The International Coin Counting Machine Co., Ltd., 43 Holborn Viaduct, London, E.C.1.

#### NUMBERING AND DATING MACHINES.

Only a comparatively few offices appear to have given sufficient attention to the importance of numbering and dating machines, and to rubber stamps, sets of type, etc. These inexpensive machines and appliances must be regarded



as essential labour-saving appliances that effect considerable economies, and the most effective and advantageous use will generally be obtained by making one clerk responsible for their supply, use, and repair. There are a large number of low priced machines on the market, but many of these cannot be recommended since they soon get out of order and will not stand continual use. A machine of durable construction, which is capable of accurate work and not subject to dropping or repeating numbers, is essential, and although such a machine is more expensive than the cheaper make with cast figure wheels, it is always cheaper in the end. Numbering machines can be supplied for consecutive numbering or for repeating any number automatically as many times as desired.

#### NUMBERING AND DATING MACHINES.

DENTER, ETC. J. M. Lindner, 17 Farringdon Avenue, London, E.C.4.  
EMPIRE, ETC. Frank Pitchford & Co., 11a Well Street, Jewin Street,  
London, E.C.1.

ROBERTS & BATES. The Roberts Numbering Machine Co., 63-4  
Chancery Lane, London, W.C.2.  
And from any large Stationer.

#### RUBBER STAMPS, SETS OF TYPE, Etc.

H. Savage, 96-8 Old Street, London, E.C.1.  
And from any Stationer.

## CHAPTER X

### CARD INDEX SYSTEMS

General Remarks—Card Systems generally—Loose-leaf and Card Ledgers—The Bizada, Kardex, and Acme Systems—The Cardfolio.

IN most business houses the Card Index is used in some form, and owing to the many uses to which it can be put it would be pointless to describe any one system. It is often found, however, that records which could, with great advantage, be kept on cards, are made in cumbersome books, or can only be referred to after a lengthy search through files of papers. Most people are acquainted with the main principles of card indexing, but the ability to devise a system that will afford a ready reference to any data required calls for a certain amount of knowledge and experience. Almost all stationers and suppliers of office requisites sell card indexes, but it is false economy to buy cheap cabinets and indifferent cards made by firms who do not specialize in these articles. Although any drawer and a number of cards constitute a card index, it is advisable to adopt a standard system, for no difficulty will then be encountered in obtaining further supplies of the necessary cabinets, guide cards, and other supplies.

Perhaps the most important consideration in constructing a card index is the necessity for forming a fairly accurate idea of its final capacity and scope. The abandonment of many systems would have been obviated had a "long view" been taken at their inception.

The size of the cards to be used will be dependent upon the amount of data to be collated, and unless there are very special reasons the size should be one of the standards— $5'' \times 3''$ ,  $6'' \times 4''$ ,  $8'' \times 5''$ . Having formulated the type of information to be recorded, the best arrangement of the cards for reference must be determined. This will resolve itself into alphabetical or numerical, or a combination of both, but there may be a large number of divisions and sub-divisions—*e.g.*,

a list of names may be arranged in geographical order of address—county, town, and then alphabetical order of name. Coloured cards can be used to indicate special classes or cases.

The Guide or Tab cards should receive very careful consideration, for unless they are inserted judiciously and in sufficient numbers, the system will not afford quick reference. No definite rules can be laid down as to the nature or number of guide cards required to be inserted, but some experts advocate one guide card for every twenty cards. Many different sets of alphabetical guide cards can be obtained varying in sub-division according to the number of cards in the index. Thus, for an alphabetical index of 500 cards it would be necessary to insert one guide card for each letter, but for an index running into tens of thousands, a minutely divided alphabet up to the third or fourth letter would be required. In regard to this matter the use of home-made alphabetical guide cards is strongly to be deprecated. The construction of sets of indexes needs to be done scientifically, for the number of cards that will fall into any division is, of course, not constant, the relative values of the letters of the alphabet not being the same; and the correct requirements of each letter, with the correct methods of further sub-dividing each letter, have been determined by the makers of various card indexes. Thus, the Amberg Company, in order to secure that their index divisions should sub-divide the cards evenly, sorted over 160,000 names on slips, and by tabulating the results were able to assign a numerical value to each letter and sub-division. In this way each set of divisions is computed on its own average, and alphabetical sets of guide cards can be supplied with as many as 3,200 divisions.

helpful as a preliminary measure to go through the catalogue and specimen cards of the various makers. After consideration of the different types, and with a little ingenuity, it is generally possible to devise an efficient system, but careful thought should be given, and a very extended view taken, before a system is finally adopted. Failure to envisage the final scope of the index may result in the system becoming unwieldy, expensive to maintain, and difficult to supercede. Card indexing is dealt with fully in *The Card Index System*, published by Sir Isaac Pitman & Sons, Ltd.

### LOOSE-LEAF AND CARD LEDGERS.

Ordinary ledgers are generally very bulky, clumsy, and expensive, and as it is impossible to estimate accurately the space required for each account, some accounts fill up the space allotted, some overflow, while others occupy much less; further, the posting is rather slow. To overcome these objections loose-leaf and card ledgers are now used extensively. They possess the great advantages of making it possible to eliminate dead matter, providing unlimited space for large accounts, and facilitating the easy rendering of statements; and the books can also be divided up as desired. The loose-leaf ledger system possesses the important advantage that entries can be made without removing cards from boxes, and the possibility of the accounts getting out of order is thus obviated. Much more information can be brought under the eye than can be got on to a card. Card ledgers are more bulky, but they possess many advantages over the bound ledger.

The size of the loose sheets, the heading, and ruling, and the nature of the binder vary according to the requirements of the accounting, but it is desirable to consider the various systems and adopt standard sizes, if possible.

### THE BIZADA, KARDEX, AND ACME SYSTEMS.

The advantages of a card index over book records are now generally conceded, but users of card indexes also recognize

that there are one or two disadvantages. The more often a card index is referred to the more pronounced are these disadvantages. Firstly, only one card is visible at a time,

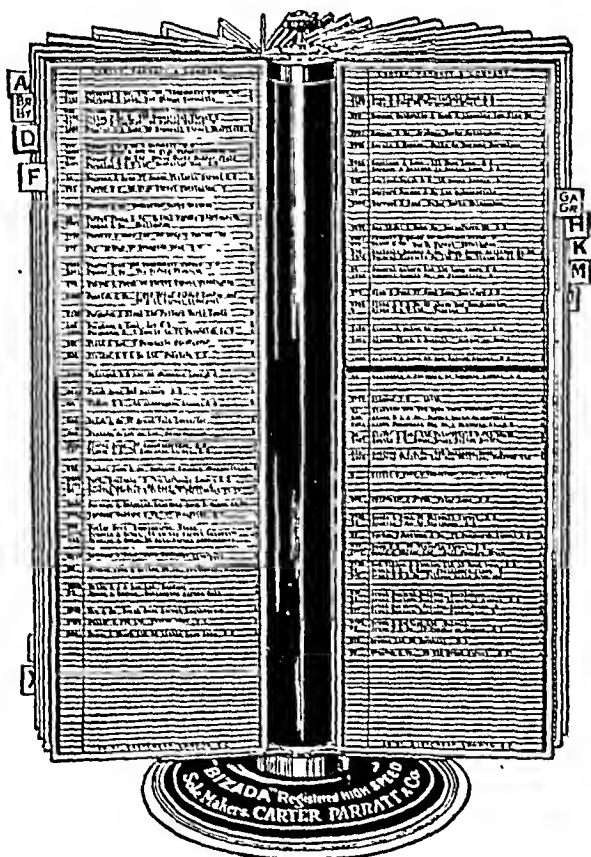


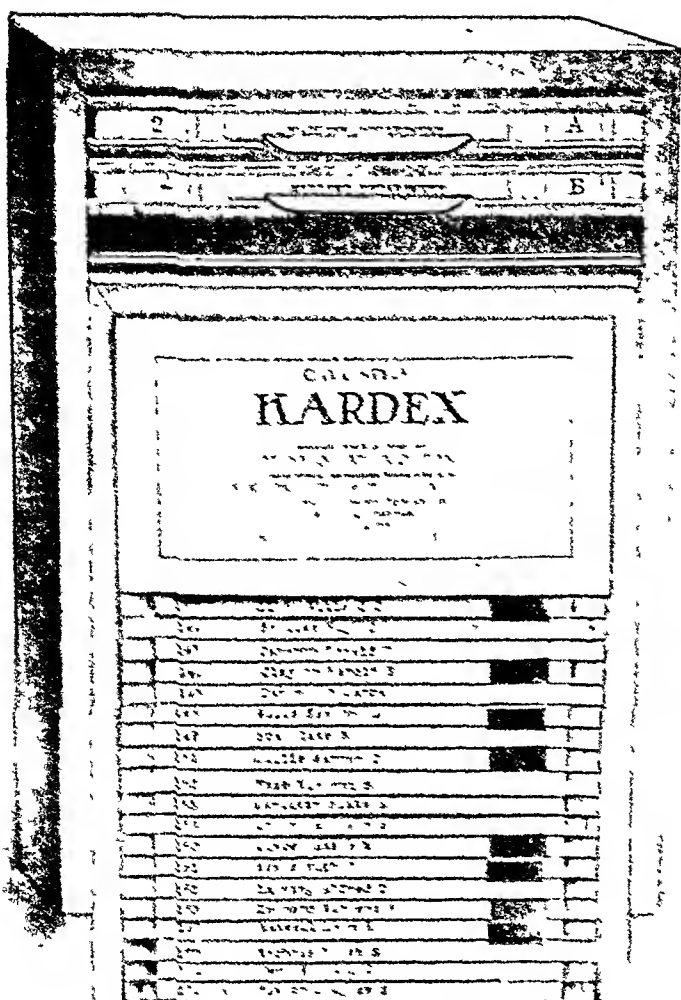
FIG. 44

BIZADA

and secondly, the card is liable to be misfiled or lost. Several ideas have now been introduced to overcome these drawbacks and at the same time retain the advantages of a card index. In the "Bizada," "Kardex," and "Acme" systems a large number of entries are visible at a glance, and corrections and additional entries can be made without removing the cards from their places, while, on the other hand, cards can easily

be added, removed, or rearranged as required. These appliances are of great utility for the keeping of all records that are in frequent demand, and the many uses to which they could with great advantage be employed will readily occur to the business man.

The equipment consists of cards (either single strip indexing cards or overlapping record cards) which are inserted in metal frames, and standards into which the frames are attached by hooks. Several types of standards are made, the rotary and sloping desk pattern suiting most requirements. The cards can be slid up and down the frames, and this permits the introduction of a new card in its proper order; a certain proportion of blank or spacing boards is inserted in the index to allow space for this. By the use of overlapping cards which can be ruled and printed to any pattern, a larger amount of information can be recorded as these cards are  $5\frac{3}{4}$ " wide and may be as deep as 8", whilst the title of each card, which is typewritten at the bottom, remains visible.



Dr. F.  
KARDEX

interlocked one into the other as to give a uniform visibility of title of  $\frac{1}{4}$ ". The pockets are interchangeable into any position in any slide, and the cabinets are so constructed that the slides may be placed in any position. By this means the records are kept in strict order with the greatest ease. On each pocket is a transoloid strip, which holds the card with the title visible through it, and at the same time protects the card. The titles are never thumbed or fingered and there is a minimum wear on the record cards which, by means of scored hinges, are operated for reference and recording on both sides without the necessity of removing the card from the pocket. A card may be removed from the pocket or another inserted with ease, and the removal of a card automatically signals its absence.

There are eight different coloured signals which can be inserted in front of the cards in the strips. They are transparent and do not obscure the titles, and as they may be moved along the strip a large number of sight classifications can be formed by them. These signals greatly facilitate the extraction of statistics and the keeping of special features always under control. Any number of classifications may be made without breaking the continuous alphabetical, numerical, or geographical arrangement.

It is apparent that by far the greater portion of time taken in the operation of any vertical card system is expended in finding, removing, and replacing the cards. A great part of this unproductive effort is undoubtedly saved with these systems.

## THE CARDFOLIO.

The Cardfolio, or the card in the folio system, embodies a combination of the principles of the loose-leaf and the cabinet card index systems. It is not suggested that these systems should be supplanted by Cardfolio as for certain classes of work they may be more suitable. As for certain classes of requirements Cardfolio undoubtedly does for many business systems. It remedies the defects that exist in these systems.



Cardfolio is a system of filing cards upon the leaves of loose-leaf binders. This system, while retaining the unit principle of the ordinary card cabinet index, enables a number of cards to be seen at one glance; corrections can be made without removing the card, which eliminates the risk of mis-filing; new entries can be made on the blank cards which are

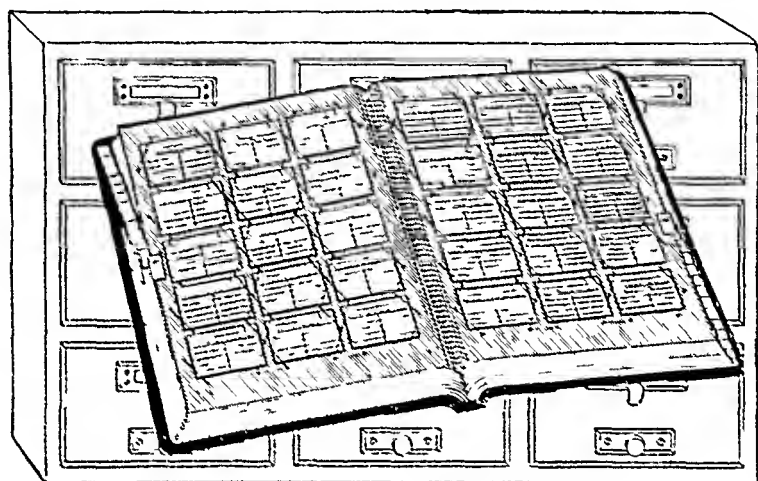


FIG. 46  
CARDFOLIO

inserted at intervals. As many as 1,000 cards can be scanned by merely turning over thirty-four leaves of a book; and the cards are unspillable. The cards are securely held in position by silk lacing, which is arranged to cross the four corners of each card and enables them to be removed when required by slightly bending them. The loose-leaf sheets are held within non-protruding sectional post binders.

There is undoubtedly a wide field in which the cardfolio would be an improvement on the ordinary card index, and business men will soon appreciate in what directions the system can be applied.

#### CARD INDEX SYSTEMS.

ACME The Macey Co., Ltd., 65-6 Hounslitch, London, E.1.

AMBERG. Amberg File & Index Co., 27 Little Britain, London, E.C.1.

## CHAPTER XI

### FILING SYSTEMS

Filing Systems generally—Shannon Direct Name—Dewey Decimal System—Roneo Numeralpha—Letter Copying—The Carbon Process—The Press Copy and the Rotary Copier—The Carbotyp and Manifolding Systems.

FILING undoubtedly forms one of the principal parts of the work of an office, and is of such importance that the success of a business can be greatly aided or seriously jeopardized by the good or bad methods adopted with regard to the filing of its correspondence. The primary object of filing is to bring together for preservation and easy reference the inward and outward correspondence relative to one firm or subject. The essential requirements of any filing system are—

- (a) Certainty of reference, *i.e.*, ability to trace any paper or to connect up the papers relating to any particular subject.
- (b) Rapidity of reference.
- (c) Rapidity of filing.
- (d) Simplicity of system (anyone in the office should be able to use it).
- (e) Storage in a minimum of space.
- (f) Low cost of operating.
- (g) Capability of expansion or contraction of the whole or any part.

It is not proposed in this chapter to deal with Filing Systems in such a way as to enable a business man to select the one suited to his office, but only to indicate roughly the systems available and to give the names of the principal makers. Many books are available that deal with systems of filing in detail. Further, there is no one system of filing correspondence that can be considered the most suitable for all offices, with the diverse nature of their activities and requirements. A system which can be regarded as perfect for one office might require amplifying for another, and be much too elaborate for a third. It is, therefore, impossible

to advocate any particular system, for the system must be adapted to the special conditions of each office, not the office to the system.

In many offices the system of filing has not received the consideration due to it, with the result that unsuitable or antiquated methods are in use, which are not only inefficient, but frequently occasion much unnecessary work and expense. It is absolutely essential in mapping out a system to have regard to the ultimate size of the scheme, for a system which works well when the correspondence handled is small might be quite incapable of meeting the requirements of great or even moderate expansion. A frequent review of the work of the filing department is also desirable, for the circumstances of an office may alter considerably, and processes once absolutely essential may later serve no useful purpose.

The principal systems of filing fall under four heads—

- (a) The Pigeon Hole or Docket Method.
- (b) The Flat Docket or Dossier System.
- (c) The Flat or Horizontal Filing System.
- (d) The Vertical Filing System.

### PIGEON HOLE OR DOCKET METHOD.

This method is now regarded as antiquated, and in any case could only be used in a very small office; yet a large number of offices still maintain folded or "document" files, although the system is only useful for filing agreements, leases, deeds, etc. It consists in folding the letters to a standard size, docketing on the back the name of the correspondent, the date of the letter and a brief summary of the contents and reply. They are then sorted into lettered pigeon-holes of a cabinet and periodically tied up and stowed away.

### THE FLAT DOCKET OR DOSSIER SYSTEM.

This system is in great use in Government, public and legal offices. The nature of the correspondence of these offices is quite different from that of a commercial office, and the system affords a special means of dealing with matters by minuting,

etc., and gives a very wide reference. A whole book would be required to describe this system in detail owing to the varied nature of the principles adopted. Shortly, it consists of a form of folder called the docket, jacket, or skin, in which the correspondence relative to one person or subject is filed; but the main feature is the minutes, or office notes, that are written on the docket and on follow-on minute sheets. The dockets are usually filed numerically and a comprehensive card index or register gives a reference under name or subject. The classification of the papers is determined by the nature of the correspondence dealt with, and the heads under which the papers are generally filed are framed so that the precedents of each subject may easily be brought up.

The correspondence and minute sheets are held together in the docket cover by a tag, and several docket covers are tied with tape—formerly red. As compared with flat and vertical filing, this system affords much greater economy of space and equipment as well as lending itself more readily to division of labour. The nature of the correspondence of a large public office differs in so many respects from that of a commercial office, that it is doubtful whether the commercial system would suit its special requirements.

### THE FLAT OR HORIZONTAL FILE.

The flat file represents the first real attempt at systematic filing, and it has not been entirely supplanted by the more up-to-date vertical flat file. There are on the market several excellent systems of flat filing, and there are many offices in which the horizontal is still preferred to the vertical. These systems vary considerably in detail but little in principle. The following photo of a Shannon File, which is practically a drawer from a cabinet, shows clearly this system.

This system does not require the removal from the file of a letter every time reference is made, and the security of the system is therefore very great. When a file is full or at regular intervals it is emptied, the contents, in exactly the same order, are placed in transfer or binding cases, which

are lettered and numbered on the outside and placed in the bottom part of the cabinet or on shelves.

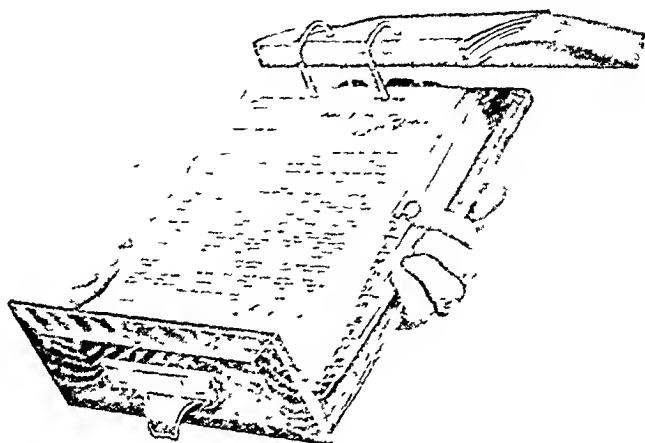


FIG. 47  
SHANNON FILE

### THE VERTICAL FILE.

It has been asserted by competent authorities that there is no better method than the vertical for filing documents :

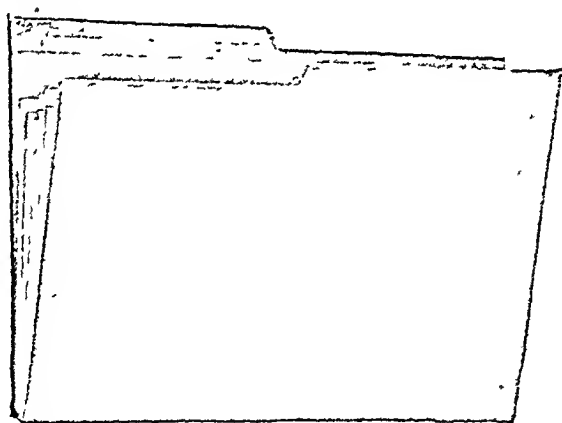


FIG. 48  
FOLDER

but every system is dependent upon the human element, and indiscriminate indexing and errors in sorting will impede

the smooth working of even a vertical system. One great drawback of a vertical system is that every time a letter is referred to it has to be taken from the cabinet and put back,

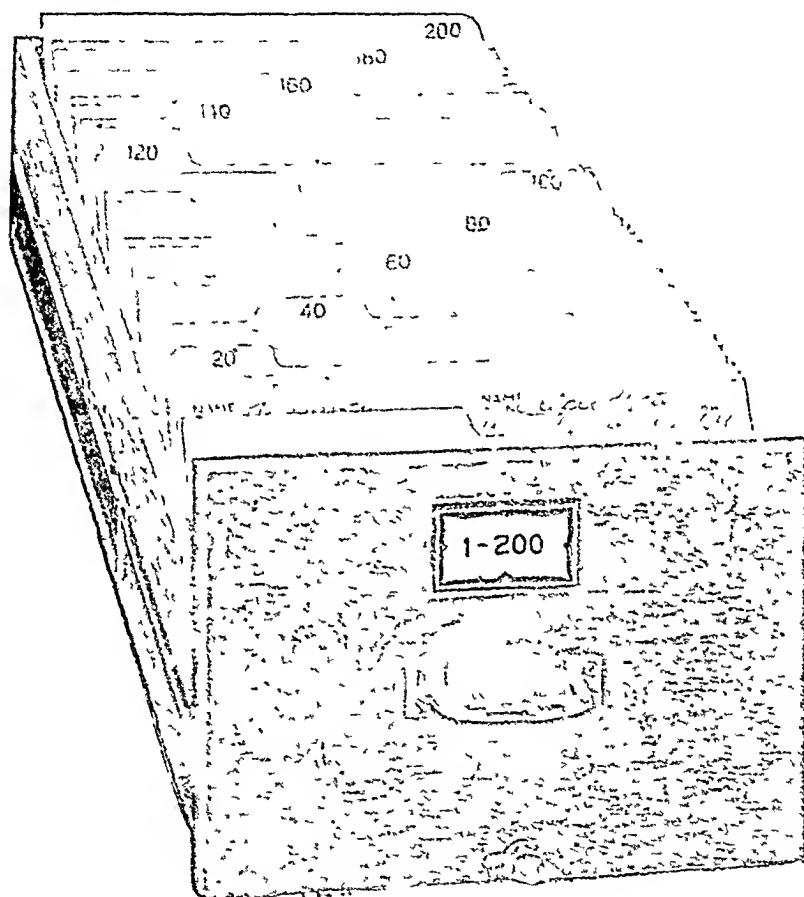


FIG. 49

## NUMERICAL VERTICAL FILE

thereby affording an opportunity for refiling in the wrong place. The efficiency of a filing department depends upon the consideration that is given to the principles formulated for the working of the system. Before any new system is started a most minute inquiry should be made into the nature of the correspondence to be filed and the kind of reference

required, for it is obvious that once the system is planned the principles laid down must be rigidly adhered to, and the

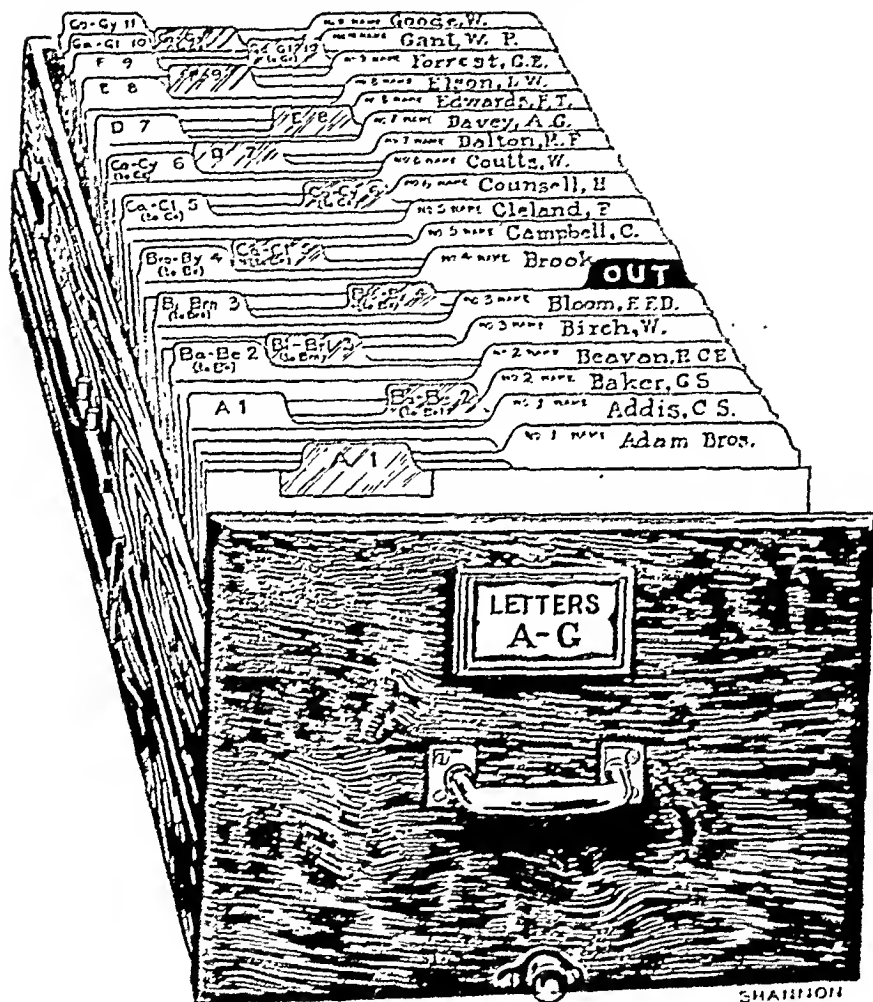


FIG. 50

## SHANNON DIRECT NAME FILE

staff cannot be permitted to make any re-arrangement or to depart from those principles.

Vertical filing consists of sorting all correspondence (both inward and outward) dealing with one firm or subject

chronologically in an individual folder or cover, the last letter being placed in front of those previously filed.

These folders are then placed vertically in files or drawers of a cabinet, and follow a definite arrangement like cards in a card index. The arrangement which the folders take varies with the requirements of different offices, but it is usually alphabetical, numerical, subject, or geographical. Most commercial correspondence is filed alphabetically, and it is undoubtedly the system which affords the least opportunities for error. The trend of all modern systems is in the direction of simplicity and opposed to undue elaboration.

The Shannon Direct Name System combines the alphabetical and numerical. All the correspondence is filed in alphabetical order, and the firms' names are always visible when the cabinet is open. The principal feature of this system is the "Direct Name" folder. In the case of the miscellaneous folders the tabs project upward on the extreme left, while the general folders bear the names and addresses of the correspondents. These names and addresses are typed on gummed slips of various colours and then gummed on the folder, this being, of course, much neater and more distinct than manuscript. Alphabetical guides are interpolated, but with a little experience a filing clerk can generally refer direct to the names on the folders without consulting the guides for the sub-section. When a folder is taken out of the filing department a record is made on a red "out" guide so that the exact location of every file is known.

This system obviates the use of composite numbers which are always confusing.

**NUMERICAL INDEXING FOR VERTICAL FILING** is necessary where the nature of the correspondence is extremely diverse and where a subject index is also required. In this system the correspondents or subjects are assigned separate numbered folders, which are arranged in drawers in numerical order, and guide cards are inserted at certain intervals. Most numerical systems are accompanied by a card index, and it is thus possible to cross-index all the correspondence to an



unlimited extent. An investigation into the subject classification of correspondence of a number of firms revealed that few were scientific, and that elaborate methods of classifying had been adopted which were often illogical. The general systems in use are not in the least consistent and can only be described as numerical methods of finding documents. The method of numbering all the letters under one series of progressive numbers enables given letters to be found readily, providing the file number is known. It is, of course, necessary to arrange space for expansion only at the end of the sequence. In these systems it is always necessary to keep a register or card index in order to locate the correspondence. The card index is not itself a filing system and must be worked on a separate basis.

There is no reason why correspondence should not be classified numerically under subjects, each subject being allotted a definite code number. Such a system may, of course, become very complex, but with well defined subjects and subdivisions it may be possible to arrange correspondence as well as cards in such a manner as to make them readily accessible.

The *Dewey decimal system* of library classification has been applied to the filing of the correspondence of many firms in America. The scheme is roughly as follows: The work of an office is divided into broad divisions (not more than ten in number) to each of which is allotted a code number (e.g., 0, 1, 2, 3, 4, etc.). Each of these divisions is again split up into a number of sub-divisions, and each sub-division again, if necessary, into further parts, any particular subject being known by a number made up of the figures representing the several divisions or sub-divisions.

The following example of the classification of the correspondence of a telephone company (quoted from United States Commission on Economy and Efficiency) will serve as an illustration.

000	General	400	Equipment
100	Executive	500	Operation
200	Finance and account.	600	Rate.
300	Construction		

Each of the above general classes is susceptible of further sub-division by the employment of additional digits. For example, the heading "300 Construction" is sub-divided as follows—

300	Construction
310	Real Estate
320	Pole lines
330	Circuits, loops, phantoms, etc.
340	Conduits
350	Poles, wires, etc.
360	Cables
370	Private lines, wire, etc.

No. 310 is sub-divided thus—

310	Real Estate
310·1	Purchase of property
310·2	Construction of new buildings
310·3	Maintenance of real estate.

And No. 310 2 is sub-divided as follows—

310·2	Construction of new buildings
310·21	Plans and specifications
310·22	Contracts for new buildings
310·23	Interior appointments

No. 310 23 has these sub-divisions—

310·23	Interior appointments
310·231	Furnishing
310·232	Heating plant
310·233	Lighting.

And No. 310·233 is sub-divided into—

310·233	Lighting
310·233·1	Electric wiring
310·233·2	Gas fixtures
310·233·3	Oil.

The scheme of classification is certainly a very ingenious one, but all the advantages claimed for it by its advocates are by no means evident in practice.

Any filing scheme to be of real value must be capable of unlimited expansion, as it is desirable that the activities of a business should not be stultified because of the inability of the system of filing to cope with a sudden increase in the amount of the correspondence. A good elastic system will

not be rendered inefficient by *any* increase in volume, however sudden or great. The Dewey decimal system *on paper* provides for this expansion, but is likely, in actual practice, to become entirely unworkable. If, for instance, the correspondence of a business house using this system suddenly expanded, as some did during the late war, to about ten times the amount received in pre-war days, it is obvious that sub-division of subjects would have to be carried out to such an extent that the number of digits used to represent one of the lowest units of sub-division would be comparatively enormous. In this way the inconvenience caused by an error in one of the digits, or by the transposition of two or more of the digits (a thing likely frequently to occur), would be very costly as well as very irritating.

Another, and perhaps the most important, objection to the Dewey scheme is the fact that provision can only be made for the division of the work of an office into not more than ten separate main classifications. Such a condition might conceivably not be inconvenient for a small business house dealing with comparatively few commodities, but in a large business house, or a Government office, having very diverse activities, it would be absolutely impossible to keep the separate primary classifications of the work down to ten, and at the same time keep the figures representing the ultimate classification of particular letters within reasonable limits.

The example given above shows the scheme at its best, but even the smallest sub-division, e.g., "oil," might conceivably in time contain hundreds of letters, and the trouble involved in finding a particular one is obvious. The position would certainly be eased by the further sub-division of "oil." But to get at "oil" seven digits are already involved (with two decimal points), and to add to these figures would be to court disaster; indeed, long experience shows that as the number of figures is increased beyond 5, the possibility (and probability) of error rises enormously.

Absent Card  
showing where  
the missing  
folder is to be  
obtained

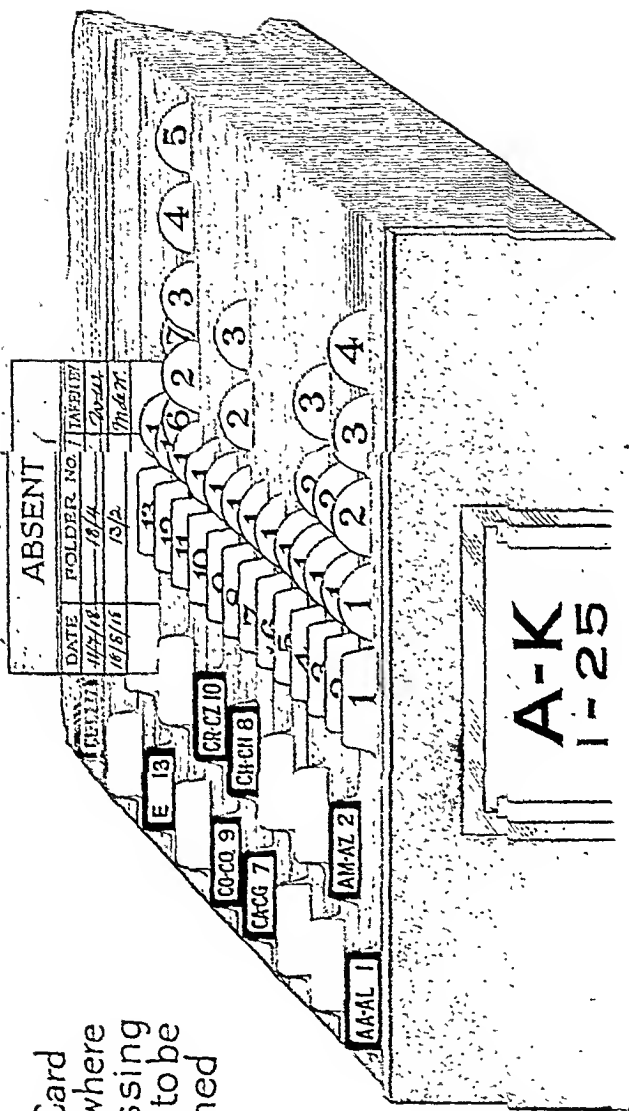


FIG. 51  
RONEO NUMERALPHIA

**THE RONEO NUMERALPHA SYSTEM** embodies a combination of the alphabetical and numerical systems of filing with a numerical arrangement. It is claimed that the system is so self-indexing and complete in itself as to eliminate the necessity for any card index or book records; and, further, it is said to have all the advantages of the alphabetical and of the numerical systems, and to eliminate all the difficulties that are attached to each.

Although the arrangement followed is a combination of both, the basis is alphabetical, and the numerical is additional but works side by side with the former. The system is undoubtedly ingenious and should receive consideration. Although the initial capital outlay and the working expenses are heavier than those of other systems, the simplicity of operation, the rapid tracing of possible errors of filing, and other advantages may weigh very considerably.

It is not proposed to give a detailed description of the method of working this system, for it is difficult to appreciate the advantages and disadvantages without seeing it in operation, but the illustration on page 115 will demonstrate fairly completely the method of filing, although the colour arrangement of the tabs, etc., considerably facilitates the working of the system.

#### FILING SYSTEMS.

**AMBERG.** Amberg File & Index Co., 27 Little Britain, London, E.C.1.  
**FERRETT.** Ferrett Index Systems, Cromwell House, 33A High Holborn, London, W.C.1.

**GLOBE-WERNICKE.** The Globe-Wernicke Co., Ltd., 44 Holborn Viaduct, London, E.C.1.

**LIBRACO.** Libraco Ltd., 62 Cannon Street, London, E.C.4.

**LYLE.** Lyle Trading and Manufacturing Co., Ltd., Windsor House, Kingsway, London, W.C.2.

**LOCKWELL-WABASH.** Lockwell-Wabash Co., Ltd., 2 St. Bride Street, London, E.C.4.

**RONEO NUMERALPHA.** Roneo, Ltd., High Holborn, London, E.C.1.

**SHANNON.** The Shannon, Ltd., Ropemaker Street, London, E.C.2.

**SU-TALL.** Johnson, Taylor & Co., Su-tall Corner, Fore Street, London, E.C.2.

**STOLZENBERG.** Stolzenberg (Patent) File Co., Ltd., 210 Bishopsgate, London, E.C.2.

Etc., etc., etc.

## LETTER COPYING.

For business purposes it is absolutely essential to retain a copy of every letter sent out, and this is done by one of three methods—

- (a) The Carbon Copy;
- (b) The Copying Press;
- (c) The Rotary Copier.

With the almost universal use of the typewriter the carbon copy is the most usual method. But the carbon copy method has the disadvantage of not giving an exact facsimile of the letter as it was despatched, *i.e.*, with the principal's corrections and signature. It is not therefore always an absolutely reliable record, and many legal offices press-copy because the ordinary carbon is not accepted as legal evidence. It may or may not contain all the alterations, and it certainly does not include a facsimile of the actual signature.

The copying press is by no means modern, but it is still used in certain offices where it is essential to retain an exact facsimile of letters and documents with signatures, etc.

The more modern form of the copying press is the Rotary Copier, which is really a mechanical adaptation of the copying press process. The copies cannot be reproduced into a book, but are made on a roll of paper which is cut to a fixed size by the machine, and forms a loose leaf record which can be subsequently filed with the correspondence or bound into letter books. The principle of the machine is very simple, and consists, in the *ROXEO COPIER*, of a roll of paper saturated in a chemical solution, usually containing glycerine, in order to keep it moist, and in the *VICTORIA COPIER* of a roll of paper passing through a bath of water. The paper is then fed through the machine over an impression roller, together with the letters to be copied, and the length of the paper for each copy being set to a standard is then automatically cut off from the roll.

When copying work is undertaken by the office boy on an ordinary copying press, the letters are often so smeared and

blurred as to be unreadable, but with a rotary copier this is impossible, for the damping cannot be mis-judged by him. Many business houses have ceased to use the carbon copy and have adopted the Rotary Copier, but, of course, the system

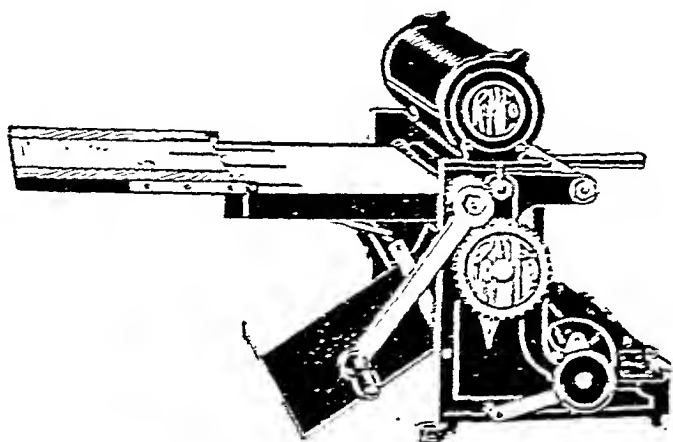


FIG. 52

## RONEO ROTARY COPIER

cannot be installed into a large concern without a certain amount of re-arrangement in the system in use. It is possible to obtain several copies from one letter, but the number depends on the inking of the ribbon used ; if a heavily-inked ribbon is used the number is, of course, greater, but these ribbons do not give a nice clear impression for the top copy. Naturally, in a small office where only a dozen letters per day are required to be copied, the cost of installing the machine could not be justified, but in the larger concerns where a heavy mail is despatched the value and economy of the machine will be more manifest.

## CARBON DUPLICATING OR MANIFOLDING

### "CARBOTYP."

The reproduction of copies of documents by means of carbon sheets is too well known to need any comment. It

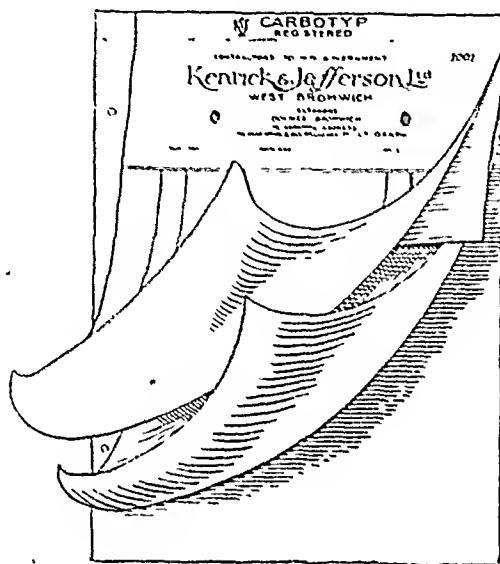


FIG. 53

#### CARBOTYP

"Carbotyp" Quadruplicate Billing Set for typing at one operation. Invoice, Package Label, Agent's Copy, and Day Book Sheet.

is, however, recognized that the making up of sets of forms, etc., interleaved with carbons entails time and trouble, and is the cause of errors. In the "Carbotyp" system the various sheets required for a letter or document and its copies are made into "sets," fastened together at the top, the carbons being inserted by the operator when required. This fastening does not mean a thick headpiece to the set which would hinder the insertion into the typewriter. The headpiece with the fastening is called the "stub," and the various forms are detachable by means of a very fine perforation which is scarcely visible when detached. "Carbotyp" sets afford



many advantages, among which may be mentioned : (a) An exact facsimile is secured of the letter as despatched, complete with alterations and signature ; (b) " perfect registration " is obtained for each form (*i.e.*, every item of information appears in its correct position on every form) ; (c) it is impossible to omit any form ; (d) being rigid, the set is easily handled in the typewriter and cannot slip in passing round the platen ; (e) when being checked, each error has to be corrected once only, *i.e.*, on the original or top copy ; (f) it is not necessary to stamp or write on each duplicate " (signed)..... "

The greatest advantage will be obtained by devising a scheme whereby the typing of all the documents relative to one transaction can be accomplished at one operation. On the various forms required for any transaction there is certain information which is common to all, and by printing and arranging the forms to a certain " register " the information for the various departments can be copied out in one operation. In many offices a multiple order is copied and entered several times in different departments, but with " Carbotyp " only one writing is necessary. " Carbotyp " is not an arbitrary system ; the printing of the forms, the various colours assigned to the sheets, the size and general arrangement of each set can be devised to suit the particular business. For correspondence there is the greatest advantage in sending the letter together with the flimsies for signature, seeing that any corrections of the actual letter are thereby automatically secured on the copies. This is very important, for, in using the ordinary methods of carbon duplicating, it frequently happens that the carbon copy does not bear the signature and corrections made by the chief ; and for this reason alone many concerns retain the press-copy system.

Space does not permit of the mention here of the great variety of purposes to which this system can be applied, but careful consideration of the routine work of any department will reveal a number of possible uses.

There are also several other labour-saving systems for copying and routine work. The Paragon, the Vicash and

the Manifoldia systems have much the same objects in view and enable multiple copying work to be performed very economically and efficiently.

CARBOTYP. Kenrick & Jefferson, Ltd., 22 St. Andrew Street, Holborn Circus, London, E.C.4.

MANIFOLDIA. Manifoldia, Ltd., West Bromwich.

PARAGON. Paragon (Lamson) Supply Co., Ltd., Paragon Works, Canuing Town, London, E.16.

VICASH. Vick, Ashworth & Co., Ltd., 37 Strand, London, W.C.2.

## CHAPTER XII

### INTER-COMMUNICATING TELEPHONE SYSTEMS

General Remarks—The Dictograph—The Relay Automatic—The "New System."

THE telephone has now become an essential part of office equipment, and its value as an aid to office efficiency is so great that business men are anxious to secure its best working over every minute of the day. The necessity for the installation of the telephone is generally accepted, and any improvements for the efficiency of the general telephone service rests with the Post Office; but inter-departmental communications are, perhaps, of greater importance; and as the Post Office monopoly does not cover these communications, business firms are able to adopt any system, providing it is not connected up in any way with the Post Office system.

Now, much of the time of the executive of any concern is spent in effecting communication with the heads of the various departments and their subordinates, and vice versa. This communication is accomplished by a variety of ways, *e.g.*, by written notes carried by messenger boys, by the speaking tube, by ringing bells, or by the telephone. As a medium of communication, the messenger boy is unreliable, for he is generally slow, absent when he is wanted, and is ready for any mischief which may be available on his short journey. The speaking tube cannot be used over long stretches, and is insanitary, being always a harbinger of dirt and germs. In ringing a bell for any member of the staff, the time of going to and returning from the executive is wasted and further time may be wasted in waiting for a person who is not there and has not received the call. The telephone undoubtedly affords the best means of communication, but its efficiency is dependent upon the rapidity of the connection.

In most offices there is a private branch exchange to the Post Office telephone, and as this necessitates going through

an exchange to obtain a house number, and going through an extra exchange to obtain an outside number, this system is obviously impaired in its efficiency for both departmental and outside telephoning. The ideal telephone system, however, eliminates from any telephone service the human element, since the manually operated switchboard, however well operated, cannot afford instantaneous connections. Therefore, practically all the modern inter-communicating systems permit one person to speak to another without the intermediary of the manually operated connecting exchange. If it is necessary to wait to get through, this entails loss of time, and loss of time to the executive of any concern means inconvenience and considerable loss of money. In offices where it is necessary to telephone through a switchboard with the aid of an operator, it is not usual to ring up the man in the room opposite or next door, it being generally quicker to call on him; but these personal calls become very expensive, for while a telephone conversation may have been limited to the question in point, other topics, not necessarily relating to the business, arise when visiting a man.

A further consideration is that it is often necessary to confer with two or more people at the same time, and the ordinary telephone does not admit of this, although "cross-connections" frequently occur. The means of communication in a concern must, therefore, be such that direct and instant conversation may be effected with any member of the staff.

There are several inter-communicating systems on the market, and the method of operating and the capabilities of each do not exactly coincide: it is therefore necessary to select the system most suitable to the circumstances or possible requirements of the concern.

## THE DICTOGRAPH.

The principal feature of the Dictograph system is that it constitutes a loud-speaking telephone. The telephone may be spoken to from any part of an average-sized room, and in

the Master Station it is not necessary to use either an ear-piece or to speak into a transmitter. An ear-piece is provided in case it is desirable to keep the replies secret from anyone else in the room; but as this is rarely necessary, the loud-speaking receiver is used and can be heard from any part of the room. Another important feature is that one can

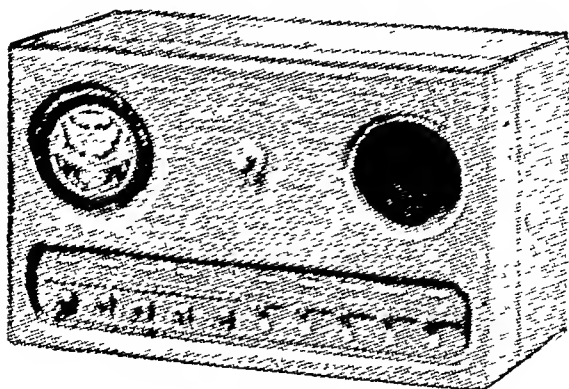


FIG. 54  
DICTOGRAPH

speak to a number of sub-stations simultaneously, and a conversation may be carried on between several people as if they were conferring in the same room.

The above is a photograph of a Master Station which can be placed on the desk. All the circuits from this 'phone cause a lamp to light when the principal calls up any of his staff, so that if the line happened to be engaged with another department, it is known at once that the chief requires the line, and the movement of the key temporarily cuts off the other call and connects at once with the principal. It is not possible for a third party to break in on or interrupt a Master Station conversation. It is hardly necessary to point out the great advantages of this system. The ability to use a telephone, and at the same time have both hands free to take notes or refer to papers, has long been a desideratum. It is also possible to receive an enquiry concerning delivery from an ordinary telephone, to switch on to the despatch

department by the Dictograph and give a reply within a few seconds. The communication is established instantly by pressing down the key corresponding to the desired station. An important feature of this system is that the "principal" never receives an "engaged" signal against his calls.

### THE RELAY AUTOMATIC SYSTEM.

The telephones used in this system usually consist of the standard Post Office pattern, to which is added a dial switch. The dial switch is a very simple device for calling the desired number.

It consists of a revolving circular plate with ten holes. In calling a number, say 56, the receiver is removed from the rest, and the tip of the finger is placed into hole 5 and the circular plate revolved to the stop. On removing the finger, the plate returns to its normal position. A similar operation is performed for the 6. The connection is made instantaneously, and if the wanted number were engaged the usual buzzing sound would be heard. Automatic ringing continues at intervals until the call is answered or until the caller puts up the receiver. Disconnection takes place automatically on replacing the receiver.

The principles of the Relay System are quite different from other inter-communicating systems, but it is not a system that is recommended for less than fifteen lines, unless long runs of cable are entailed, or where it is necessary to run open wire, in which cases a system requiring a multiple cable would not be practicable. In most inter-communicating systems, a multi-wire cable is run from each telephone to every other telephone, and it is therefore necessary to provide for each instrument as many wires as there are other instruments. These systems are, therefore, not capable of unlimited extension, and even the addition of one line presents certain difficulties and much wiring. Now the Relay System is capable of extension by the laying of only two lines, since each 'phone only requires two wires to the Automatic Exchange, and there is practically no limit to the number

of lines that can be fitted; it is, therefore, the best inter-communicating system for a firm where a large number of lines will be required. The multi-wire systems cannot be considered for a large number of stations.

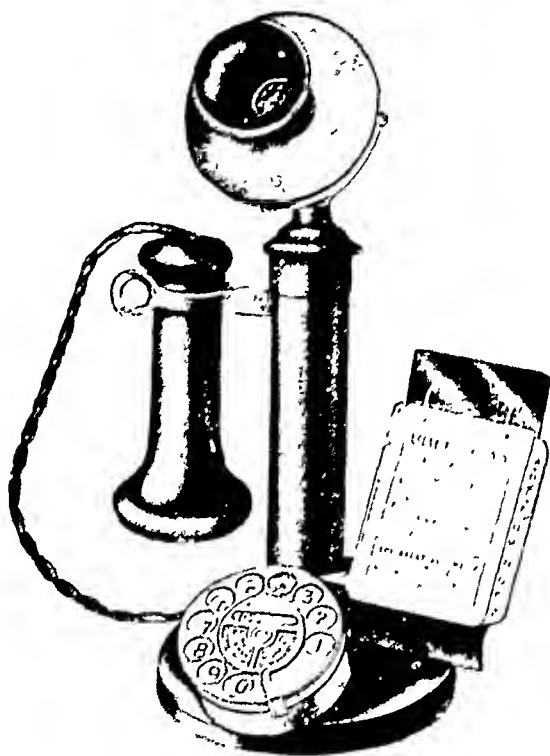


FIG. 55

## RELAY AUTOMATIC

The working of the whole system is accomplished by an automatic relay exchange. This exchange is built entirely of relays, which perform all the operations of selection, connection, ringing, buzzing "engaged," and disconnection. In the past, relays have entailed the use of complicated electro-mechanical switches, but in this system there are practically no moving points to get out of order and to be kept oiled, and adequate protection is afforded against heat

and damp. The cost of the initial installation is rather high for a few lines, but for larger installations it is quite reasonable when the saving of time and other advantages are taken into consideration, and compares favourably with that of other systems. Perhaps the greatest advantage that this system can claim over all others is that there is absolute secrecy and not the least possible risk of any overhearing on any lines :

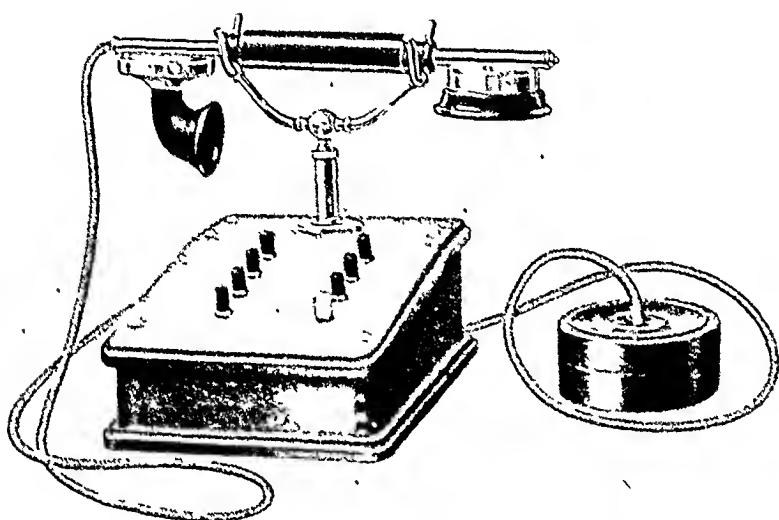


FIG. 56  
THE "NEW SYSTEM"

and as there are no operators, the use of the system is available at all times. Further, if the premises are extended it is a simple proposition to add new lines without touching or interfering with the existing apparatus.

### THE NEW SYSTEM.

The above illustration is the standard pattern, although there are many adaptations. Opposite each button a name-plate is fitted, and the depression of a key rings the desired station. It is possible to ring two or more stations



simultaneously and carry on a conversation with a number of people. A selective secret control is also fitted, which enables the two instruments connected to be isolated, and no over-hearing or interruptions can then take place. The "Auto Line Finder" is automatically controlled, and the visual indicator shows the number of the calling line at the receiving station. Another feature of this system is the Round Call Signal. If, on calling certain officials, no reply is received, the round call key is depressed and a pre-arranged code signal sounds simultaneously at every 'phone on the premises, and the person called, by depressing the round call button on the nearest 'phone, is connected to the person calling him. This round call signal can be employed for fire alarms and a variety of other purposes. When the receiver is replaced, the key rises and automatic disconnection takes place.

#### INTERCOMMUNICATING TELEPHONES.

**DICTOGRAPH.** Dictograph Telephones, Ltd., 8 Denham Street, London, S.E.1.

**NEW SYSTEM.** London Telephone (New System) Co., Ltd., Donington House, Norfolk Street, London, W.C.2.

**RELAY AUTOMATIC.** Relay Automatic Telephone Co., Ltd., Marconi House, Strand, London, W.C.2.

**RELIANCE.** Reliance Telephone Co., Ltd., 12-13 Henrietta Street, London, W C 2

**SELECT-O-PHONE** Pettigrew & Merriman, Ltd., 7 Henrietta Street, London, W C 2

**SIEMEN'S AUTOPHONI** Siemens Bros. & Co., Ltd, Woolwich, London, S E 18

## CHAPTER XIII

### CENTRALIZATION OF MACHINE WORK

*Centralizing Typewriters and Duplicators—Dictating Machines.—The Dictaphone—The Ediphone*

IN very large offices it is frequently found that the work is divided into territorial or other divisions, so that each department performs analogous work. Now, in each of these departments there may be a small amount of work that could be performed by machines, but which is not sufficient to justify their installation. The most economical use of machines can be secured by centralization; and in order to show the advantages of "pooling" machine work, it is proposed to deal with the centralization of typewriting work.

When shorthand-typists were first introduced into commerce they were few in number and, consequently, were assigned to the heads of the concern; and as their introduction has proceeded, so they have been allocated to the work of particular men, with the result that in many large concerns all the girls work for certain men or in watertight compartments. When each officer is able to keep the girl fully employed on each day, this arrangement is undoubtedly sound; but an investigation into the work of the average personal shorthand-typist will demonstrate very clearly that often she has only a few hours' work a day, and fills in her time with 'phoning, filing, or seeing to her own affairs. This arrangement then becomes not only uneconomical, but undesirable. When a more economical arrangement of the staff is suggested, the men to whom these girls are attached may argue that it is very convenient to have the services of the stenographer at the moment they wish; they may claim that the girl is fully employed, but an inspection of her note-book or record of output will probably refute this; they may say that she does all the filing, but this may

amount to half an hour's work a day, or is work that should be done by the filing department; they may say that their work is technical and that no one else could do it, but when the girl is sick or on leave someone else does it; they may say that the work is confidential, for everyone usually considers that his work is the most secret in the firm; every conceivable argument to retain the girl's services will be offered. But the head of the firm must weigh all these considerations very carefully, for if the girl is not fully employed, and comparatively few are when attached to a particular man, he must be satisfied that material reasons obtain for providing that the services of the girl are limited to one or more officers. It is impossible to dogmatize on this subject, but it is often very difficult for a business man to justify the services of a personal shorthand-typist.

It is unreasonable to expect a responsible member of the staff to be continually concerned as to whether his stenographer has sufficient work to do: and, further, when he is attending meetings, travelling or taking leave, he cannot always provide for her work in his absence.

It is considered that "pooling" of the staff produces very great economy in the cost of typewriting and also effects a great saving in accommodation and machines. Further, by the division of labour the "pooled" staff is able to deal expeditiously with pressure from any particular officer or department since the staff is more mobile. The stenographers, partly by reason of the fact that their work is more varied, and partly because the spirit of rivalry is fostered, become more efficient and proficient.

The advantages of centralization may be set out briefly under the following heads—

(a) Economy of staff, accommodation, typewriters and equipment (including duplicating machines, etc.).

(b) Capacity to cope with rushes of work.

(c) Equal distribution of work, thus avoiding the dislocation of the arrangements which eventuate when pressure of work arises in any particular department.

(d) The "fall" of the work for the whole organization will be more constant than for any single officer or branch.

(e) Overtime will be eliminated (by late rotas of duty if necessary).

(f) Well-trained and efficient typists will be available for promotions to posts of secretaries, supervisors, etc.

(g) The display, etc., of the work will be standardized throughout the concern.

(h) The first class typists will be employed almost solely on the work for which they are paid, and minor copying jobs will be performed by juniors.

(i) By providing that certain girls always work for particular officers the personal objections are disposed of.

(j) The work of a central department is not hampered to any extent by the normal incidence of sickness, leave, and resignations.

### KINDS OF POOLING.

It is recognized, however, that many factors may obtain which preclude the centralization of the typing staff. The principal objection is generally the "geography" of the building. In these cases some modification of centralization may be possible by pooling for each department, floor, or building. In other cases it is possible to centralize if a few "pockets" of shorthand staff are assigned to particular groups of officers or parts of the building. In very large offices it will almost invariably be found necessary to centralize by constituting a number of pools. Further, it is always possible to arrange that the girls in a pool are assigned to particular officers so that an officer will always have the first claim on a particular stenographer, but when he does not require her, she can be employed profitably on the general work of the "pool" or assisting other girls who are pressed. This proviso to "pooling" is frequently overlooked, but it not only forms the "best card" in favour of centralization by disposing effectually of many objections, but also works to the advantage of the firm and to the satisfaction of the girls.

## ADVANTAGES TO THE STENOGRAPHERS.

A certain amount of antagonism is generally shown by personal shorthand-typists to centralization, for they say it is opposed to the personal element in the work, and they may be precluded from doing only and solely the work of one individual. They further argue that pooling eliminates initiative and responsibility. The work of a stenographer tends to become very monotonous if it is not varied, and it is highly desirable that her work should be varied, for apart from the fact that the monotony is thereby alleviated her general efficiency is considerably enhanced. It must be remembered that the stenographer who is able to perform efficiently and at high speeds the work of one particular man only, is of less value than the operator who can take all classes of work at lower speeds. Specialization in general is to be commended, but this matter must be regarded from the point of view of the firm, for if only one shorthand-typist can do the work of one particular man, what will happen in cases of sickness or rush of work? Centralization also ensures that the work is tolerably well distributed, and that the anomalies now often existing as regards the amount of work performed by girls in the same office for the same salary will be removed. Every shorthand-typist, through gaining a wider knowledge of the business, will be more efficient. By working in a "pool" a girl encounters competition which proves a strong incentive to better work and higher speeds, while working with a number of girls also develops an *esprit de corps*.

Individuality is by no means killed if efficient centralization is carried out. When a secretary is required in any department of the firm, application will be made to the head of the pool for the most efficient girl, or a chief may recommend one of the girls from the pool who is now doing his work particularly well. A further advantage, particularly to stenographers who continue in business as a career, is that centralization creates supervising posts that form openings for promotion that do not exist under the old arrangement.

In the natural incidence of things these posts will fall vacant tolerably frequently, and will be given to the most efficient shorthand-typists providing they possess organizing and disciplinary abilities.

### SUPERVISION.

It is imperative that a competent head should be in charge of the pool, for the efficiency and success of the branch will depend in a pre-eminent degree on the practical knowledge, organizing and disciplinary powers, initiative and responsibility of that person. The head should possess a thorough knowledge of display, and should give instructions when necessary as to the correct "setting out" of any particular job. Display forms an important branch of the work, since it frequently enables matter to be completely re-arranged with a saving of labour and paper, as well as producing the work in a more legible and pleasing manner.

The girls will need to be trained, and "house" rules can be formulated as to the correct style, arrangement, etc., that all work should take.

### ORGANIZATION OF POOLS.

The organization is of paramount importance, for in the natural order of things the work will fluctuate, and the expediency and success of centralization depend to a great extent on the ability to cope with rushes of work. If the office is divided into, say, six pools, some co-ordinating arrangement must exist whereby assistance can be given by other pools to a pool that is pressed with work. "Service" to the officers must never be refused and work must never be allowed to get into arrear. In most offices the bulk of the work comes late in the day, and with the personal shorthand-typist this often means that the girl has to stay late in order to finish her work. This practice, however, which is now much too common, is unfair to the girls, for if a reasonable day's work is done it is not only just but desirable that the girls should be able to leave at their specified time. Under "pooling" this is

possible, for a rota of late duties can be arranged so that a staff is always available between, say, six and seven o'clock to finish up the work of those who leave at six, and to give a service to those men who stay late. Some form of record of output of work should be kept, and weekly figures posted up: this will often increase the individual efficiency by 25 per cent. The record will also enable the supervisor to gauge each girl's capabilities, and should be referred to when promotions, increases of salary, re-gradings, etc., are being considered.

### DUPLICATING WORK.

The centralization of the duplicating work of a large establishment effects considerable economies and possesses all the advantages above. The duplicating room should be attached to the central typing department and should, of course, be supervised by the superintendent. By centralization it is possible to equip one department with many of the machines and appliances mentioned in the foregoing chapters, whereas the volume of work in each of the sub-departments of the concern would not justify their introduction.

### DICTATING MACHINES

Although it is claimed that the introduction of dictating machines automatically effects centralization of the typing staff, all the advantages of centralization can be accomplished equally well without their aid.

There are two makes of dictating machines available—the Dictaphone and the Ediphone.

into the machine. The vibrations of the voice are reproduced on the revolving cylinder. If at any time during the dictation it is desired to go over what has been said, the "dictation lever" is thrown back, the carriage moved to the left, and the words are reproduced—the sound emanating from the mouthpiece. Corrections are indicated on a correction pad. A cylinder records about 1,000 words, and when full it is placed into a case (together with a correction pad if necessary) and passed on to the typist.

The transcription from the cylinder is accomplished by placing it on the mandrel of the reproducing machine, which is similar in appearance to the dictating machine, fixing the Clarophone over the head, and by pressing the foot control the dictation proceeds concurrently with the typewriting.

Each cylinder can be shaved about 130 times before becoming too thin for use. The life of a cylinder is, therefore, not ended by once recording, and if completely used every time, one cylinder is capable of recording about 130,000 words. The shaving is done by means of a shaving machine, and the process, which occupies but a few seconds for each cylinder, can be done by the office boy. Having adjusted the sapphire knife, it travels the length of the cylinder and the shavings drop into a box.

In installing a battery of dictating machines it is, of course, not necessary to install equal numbers of the three machines. A dictating machine should be supplied for each person who dictates, but the number of reproducers will vary according to the amount of work done on the dictators. Further, one shaving machine will serve a number of reproducing machines.

## THE EDIPHONE.

The Ediphone was the first dictating machine to be invented, and it is used very extensively in America. Its capabilities are very similar to those of the Dictaphone, but there are several special features. The automatic correction device eliminates much of the trouble usually associated with correction, and the Transophone enables the typist to obtain



repetition of any passage by touching the key which is attached to her typewriter, thus avoiding the necessity of turning to the reproducer. The collapsible mandrel prevents the cylinders from sticking. The Edison cylinder is also reinforced with an inner lining of fabric which prevents many breakages, and the friction grip boxes prevent the cylinders from falling out in transit.

#### DICTATING MACHINES.

DICTAPHONE. Dictaphone Co., Ltd., Kingsway House, Kingsway, London, W.C.2.

EDIPHONE. Thomas A. Edison, Ltd., 164 Wardour Street, London, W.1.

# CLASSIFIED LIST OF OFFICE MACHINES AND APPLIANCES

(It is not claimed that this list is complete, and it does not follow that because a machine is not included it is not recommended.)

## ADDING MACHINES.

### *Non-Listing Type.*

- BARRETT. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria Street, London, E.C.4.  
BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
COMPTOMETER. Herbert E. Robbins, Ltd., Imperial House, Kingsway, London, W.C.2.  
VICTOR. Victor Adding Machine Co., 817-825 West Washington Blvd., Chicago.

### *Listing Type.*

- BARRETT. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria Street, London, E.C.4.  
BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
DALTON. The Merckham Trading Co., Ltd., 329 High Holborn, London, W.C.1.  
FEDERAL. British Federal Office Machines, 19 Regent Street, London, S.W.1.  
VICTOR. Victor Adding Machine Co., 817-825 West Washington Blvd., Chicago.  
WALES. Metro Bureau Equipment, Ltd., 8 Queen Street, London, E.C.4.

## ADDING TYPEWRITERS.

- REMINGTON WAHL. Remington Typewriter Co., Ltd., 100 Gracechurch Street, London, E.C.3.  
TYPE-ADDER. Type-Adder Co., 465-9 Washington Street, New York.  
UNDERWOOD. Underwood Typewriter Co., Ltd., 120 Queen Victoria Street, London, E.C.4.  
And other makes of typewriters.

## ADDRESSING MACHINES.

- ADDRESSALL. Addressall Machine Co., Rapid Works, Chorlton-cum-Hardy, Manchester.  
ADDRESSOGRAPH. Addressograph, Ltd., 91-2 Shoe Lane, London, E.C.4.  
ELLIOTT ADDRESSAMITE. The Hayward Co., 62 Red Lion Street, London, E.C.1.  
SPEED-O-FEEDER. American Speed-O-Feeder Co., Card Building, St. Clair Avenue, N.E., Cleveland, Ohio.

## BILLING MACHINES.

- BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
 ELLIOTT-FISHER. Elliott-Fisher Co., 10 Queen Street, London, E.C.4.  
 REMINGTON WAHL. Remington Typewriter Co., Ltd., 100 Gracechurch Street, London, E.C.3.  
 UNDERWOOD. Underwood Typewriter Co., Ltd., 120 Queen Victoria Street, London, E.C.4.

## BOOK-KEEPING MACHINES.

- BURROUGHS. Burroughs Adding Machine Co., Ltd. 76 Cannon Street, London, E.C.4.  
 ELLIOTT-FISHER. Elliott-Fisher Co., 10 Queen Street, London, E.C.4.  
 ELLIS. Ellis Adding Typewriter Co., Newark, New Jersey, U.S.A.  
 INTERNATIONAL MONEY MACHINE. International Money Machine Co., Reading, Pa., U.S.A.  
 REMINGTON-WAHL. Remington Typewriter Co., Ltd., 100 Gracechurch Street, London, E.C.3.  
 UNDERWOOD. Underwood Typewriter Co., Ltd., 120 Queen Victoria Street, London, E.C.4.

## CALCULATING MACHINES AND APPLIANCES.

*Ready Reckoner, Rating Tables, etc.*

- Gall & Inglis, 31 Henrietta Street, London, W.C.2.  
 Frederick Warne & Co., Bedford Court, Bedford Street, London, W.C.2.  
 John Gibson, 53 Coleman Street, London, E.C.2. (COTSWORTH'S.)  
 C. H. Elsdon, 48 Empress Avenue, Ilford. (FLAP TABLES.)  
 Robertson Rapid Calculating Machine Co., Ltd., 140 Bath Street, Glasgow.

*Slide Rules.*

- FULLER CYLINDRICAL SLIDE RULE. W. F. Stanley & Co., Ltd., 286 High Holborn, London, W.C.1.  
 PIECE-WORK WHEEL CALCULATORS. Smith, Davis & Co., Amen Alley, Derby.  
 ROULEAU ROTARY SLIDE RULE. M. L. Gordon & Co., 9 St. Martin's Court, Charing Cross Road, London, W.C.2.  
 Any dealer in mathematical instruments.

*Calculating Machines.**Key operated.*

- BURROUGHS. Burroughs Adding Machine Co., Ltd., 76 Cannon Street, London, E.C.4.  
 COMPTOMETER. Herbert E. Robbins, Ltd., Imperial House, Kingsway, London, W.C.2.

*Crank operated.*

- ARCHIMEDES. Gilbert Wood, 75B Queen Victoria Street, London, E.C.4.  
 BRUNSVIGA. J. Miller, 48 Clerkenwell Green, London, E.C.1.  
 GUY'S. Guy's Calculating Machine, Ltd., Truro Works, Truro Road, London, N.22.

LAYTON'S ARITHOMETER. C. and E. Layton, 56 Farringdon Street, London, E.C.4.

LEHIGH. The Lehigh Corporation, 25 West 43rd Street, New York.

MADAS. Gilbert Wood, 75B Queen Victoria Street, London, E.C.4.

MARCHANT. C. Beveridge, 112 Queen Victoria Street, London, E.C.4.

MULDIVO. Muldivo Calculating Machine Co., Ltd., 49 Queen Victoria Street, London, E.C.4.

TIM. George Spicer, Market Place, Brentford.

TRIUMPHATOR. C. Beveridge, 112 Queen Victoria Street, London, E.C.4.

*Key and Crank operated.*

MILLIONAIRE. Gilbert Wood, 75B Queen Victoria Street, London, E.C.4.

MONROE. The National Office Equipment Co., 61 Queen Victoria Street, London, E.C.4.

### CARBON DUPLICATING SYSTEMS.

*(See Manfolding Systems.)*

### CARD INDEX SYSTEMS.

ACME. The Macey Co., Ltd., 65-6 Houndsditch, London, E.1.

AMBERG. Amberg File and Index Co., 27 Little Britain, London, E.C.1.

BIZADA. Carter Parratt, Ltd., 2 Farringdon Avenue, London, E.C.4.

CARDFOLIO. The Office Appliance Co., Ltd., 6 Livery St., Birmingham.

GLOBE WERNICKE. Globe Wernicke Co., Ltd., 44 Holborn Viaduct, London, E.C.1.

KARDEN. Kardex Visible Card Systems, 3 Holborn Viaduct, London, E.C.1.

KENRICK & JEFFERSON LTD., 22 St. Andrew Street, London, E.C.4.

LIBRACO. Libraco, Ltd., 62 Cannon Street, London, E.C.4.

LYLE. Lyle Trading and Manufacturing Co., Ltd., Windsor House, Kingsway, London, W.C.2.

MOORE'S MODERN METHODS. Moore's Modern Methods, Ltd., 12 St. Bride Street, London, E.C.4.

SHANNON. Shannon, Ltd., Ropemaker Street, London, E.C.2.  
Etc., etc., etc.

### CHEQUE WRITERS.

ELLIOTT-FISHER PIN POINT. Elliott-Fisher Co., 10 Queen Street, London, E.C.4.

PROTECTORAPH. Halsby & Co., Ltd., 6 St. Bride Street, London, E.C.4.

SAFE-GUARD. Lanston Monotype Corporation, Ltd., 43 and 43A Fetter Lane, London, E.C.4.

### COIN COUNTERS AND SORTERS.

INTERNATIONAL. International Coin Counting Co., Ltd., 43 Holborn Viaduct, London, E.C.1.

### DICTATING MACHINES.

DICTAPHONE. Dictaphone Co., Ltd., Kingsway House, Kingsway, London, W.C.2.

EDIPHONE. Thomas A. Edison, Ltd., 164 Wardour St., London, W.1.

### ENVELOPE FILLING AND SEALING MACHINE.

Multi-Insert Mailing Machines Corporation, Tribune Buildings, New York.

### FILING SYSTEMS.

AMBERG. Amberg File and Index Co., 27 Little Britain, London, E.C.1.  
 FERRET. Ferret Index Systems, 33a High Holborn, London, W.C.1.  
 GLOBE WERNICKE. Globe Wernicke Co., Ltd., 44 Holborn Viaduct, London, E.C.1.  
 LIBRACO. Libraco, Ltd., 62 Cannon Street, London, E.C.4.  
 LYLE. Lyle Trading and Manufacturing Co., Ltd., Windsor House, Kingsway, London, W.C.2.  
 ROCKWELL-WABASH. Rockwell-Wabash Co., Ltd., 2 St. Bride Street, London, E.C.4.  
 RONEO NUMERALPHA. Roneo Ltd., 5-11 Holborn, London, E.C.1.  
 SHANNON. Shannon, Ltd., Ropemaker Street, London, E.C.2.  
 STOLZENBERG. Stolzenberg Patent File Co., Ltd., 210-212 Bishopsgate, London, E.C.2.  
 SU-TALL. Johnson, Taylor & Co., Su-tall Corner, Fore St., London, E.C.2.  
 Etc., etc., etc.

### FOLDING MACHINES.

GAMMETER. International Multigraph Co., Ltd., 15-16 Holborn Viaduct, London, E.C.1.  
 Other machines can be obtained from Printers' Engineers.

### INTERCOMMUNICATING TELEPHONE SYSTEMS.

DICTOGRAPH. Dictograph Telephone, Ltd., Dictograph House, Denman Street, London, S.E.1.  
 NEW SYSTEM. London Telephone (New System) Co., Ltd., Donnington House, Norfolk Street, London, W.C.2.  
 RELAY AUTOMATIC. Relay Automatic Telephone Co., Ltd., Marconi House, Strand, London, W.C.2.  
 RELIANCE. Reliance Telephone Co., Ltd., Goschen Buildings, 12-13 Henrietta Street, London, W.C.2.  
 SELECT-O-PHONE. Pettigrew & Merriman, Ltd., 7 Henrietta Street, London, W.C.2.  
 SIEMEN'S AUTOPHONE. Siemens Bros. & Co., Ltd., Woolwich, London, S.E.18.

### LETTER COPIERS.

BRITISH VICTORIA. The British Victoria Copier Co., Ltd., 11 Queen Victoria Street, London, E.C.4.  
 RONEO COPIER. Roneo, Ltd., 5-11 Holborn, London, E.C.1.  
 SHANNON. The Shannon, Ltd., Ropemaker Street, London, E.C.2.

### LETTER OPENERS.

BIRCHFR LIGHTNING. Merkhams Trading Co., Ltd., 329 High Holborn, London, W.C.1.  
 O.K. O.K. Manufacturing Co., Syracuse, New York, U.S.A.

## LOOSE LEAF SYSTEMS.

- MOORE. Moore's Modern Methods, Ltd., 12 St. Bride Street, London, E.C.4.  
 PARAGON. Paragon (Lamson) Supply Co., Ltd., Paragon Works, Canning Town, London, E.16.  
 ROCKWELL. Rockwell Wabash Co., Ltd., 2 St. Bride Street, London, E.C.4.

## MANIFOLDING OR CARBON DUPLICATING SYSTEMS.

- CARBOTYP. Kenrick & Jefferson, Ltd., 22 St. Andrew Street, Holborn Circus, London, E.C.4.  
 MANIFOLDIA. Manifoldia, Ltd., West Bromwich.  
 PARAGON. Paragon (Lamson) Supply Co., Ltd., Paragon Works, Canning Town, London, E.16.  
 VICASH. Vick, Ashworth & Co., Ltd., 37 Strand, London, W.C.2.

## NUMBERING AND DATING MACHINES.

- DEXTER, ETC. J. M. Lindner, 17 Farringdon Avenue, London, E.C.4.  
 EMPIRE, ETC. Frank Pitchford & Co., 11A Well Street, Jewin Street, London, E.C.1.  
 ROBERTS AND BATES. Roberts Numbering Machine Co., 63-4 Chancery Lane, London, W.C.2.  
 And from any large Stationer.

## PAPER FASTENING AND CLIPPING MACHINES.

(See Wire Stitching Machines.)

## PARCEL SEALERS.

- IRIS SEALING TAPE MACHINE. R. A. Stephenson, Ltd., 130 Queen Victoria Street, London, E.C.4.  
 J. G. SEALING MACHINE. John Gosheron & Co., 1-3 Golden Lane, London, E.C.1.

## PENCIL SHARPENERS.

- AUTOMATIC, CHICAGO, DEXTER, ETC. Frank Pitchford & Co., 11A Well Street, Jewin Street, London, E.C.1.  
 And from any large Stationer.

## RUBBER STAMPS, SETS OF TYPE, ETC.

- H. SAVAGE, 96-8 Old Street, London, E.C.1.  
 And from any Stationer.

## STAMP AFFIXERS.

- MULTIPOST. Merkhams Trading Co., Ltd., 329 High Holborn, London, W.C.1.  
 NATIONAL. Edison-Swan Electric Co., Ltd., 123 Queen Victoria Street, London, E.C.4.  
 STANDARD. Roberts Numbering Machine Co., 63 Chancery Lane, London, W.C.2.

## STAPLING MACHINES.

(See Wire Stitching Machines.)

## STENCIL CUTTING MACHINES.

DIAGRAPH. The Diagraph Stencil Machine Co., Ltd., 82 Mark Lane, London, E.C.3.

IDEAL. Ideal Stencil Machine Co., 151 Ideal Block, Belleville, Illinois, U.S.A.

## TABULATING MACHINES.

HOLLERITH. The British Tabulating Machine Co., Ltd., 2 Norfolk Street, Strand, London, W.C.2.

POWERS. The Accounting and Tabulating Corporation of Great Britain, Ltd., 57-58 Chancery Lane, London, W.C.2.

## TELEPHONES.

(See Intercommunicating Telephones.)

## TIME RECORDERS.

BLICK. Blick Time Recording Devices, 174 Gray's Inn Road, London, W.C.1.

BUNDY. International Time Recording Co., 57 City Road, London, E.C.1.

DEV. International Time Recording Co., Ltd., 57 City Road, London, E.C.1.

GLEDHILL-BROOK. Gledhill-Brook, 26 Victoria Street, London, S.W.1.

INTERNATIONAL. International Time Recording Co., Ltd., 57 City Road, London, E.C.1.

NATIONAL. The National Time Recording Co., Ltd., 5 Blackfriars Road, London, S.E.1.

PREMIER. Premier Time Recording Co., Southampton House, 317 High Holborn, London, W.C.1.

ROCHESTER. International Time Recording Co., Ltd., 57 City Road, London, E.C.1.

RUSMOID AND KOSMOID. Rusmoid, Ltd., 15 Dartmouth Street, London, S.W.1.

## TIME STAMPING MACHINES.

BLICK. Blick Time Recording Devices, 174 Gray's Inn Road, London, W.C.1.

C.T.L. Frank Pitchford & Co., 11A Well Street, Jewin Street, London, E.C.1.

ECONOMO, ELLIS, ECLIPSE, EMPIRE, ETC. J. M. Lindner, 17 Farringdon Avenue, London, E.C.4.

RUSMOID & KOSMOID. Rusmoid, Ltd., 15 Dartmouth Street, London, S.W.1.

STANDARD. International Time Recording Co., Ltd., 57 City Road, London, E.C.1.

## TYPEWRITER ADDERS.

(See Adding Typewriters.)

## WIRE STITCHING AND STAPLING MACHINES.

BRITISH WIRE STITCHER. British Wire Stitching Machine Co., Blind Lane, Palmer's Green, London, N.13.

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